

Midlothian ISD Stadium Additions and Renovations

Midlothian Independent School District
O|W Project No. 2021_154



orcutt|winslow

ARCHITECTURE PLANNING INTERIOR DESIGN

WWW.OWP.COM

MIDLOTHIAN ISD STADIUM ADDITIONS AND RENOVATIONS

FOR

MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT

PROJECT MANUAL
100% CONSTRUCTION DOCUMENTS

OCTOBER 07, 2021

ORCUTT | WINSLOW
ARCHITECTURE PLANNING INTERIOR DESIGN

O | W #2021_154

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10/07/2021

Civil & Landscape
Midlothian ISD
Stadium Additions & Renovations

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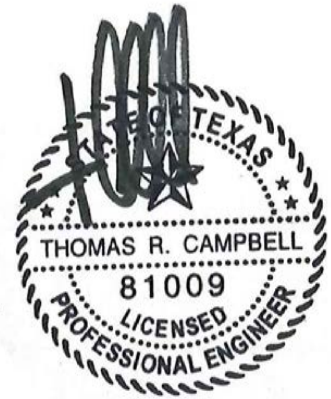
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10.07.2021
CA F-1010



REQUEST FOR COMPETITIVE SEALED PROPOSALS

Competitive Sealed Proposals for the work identified below in accordance with Proposal Documents and addenda as may be issued prior to date of proposal opening will be received by the Board of Trustees, Midlothian Independent School District, until proposal closing date and time, as identified below. Proposals from Offerors will then be opened in public and read aloud.

OWNER: **Midlothian Independent School District**
100 Walter Stephenson Road
Midlothian, TX 76065

ARCHITECT: **Orcutt Winslow**
222 W. Las Colinas Blvd. Ste. 749E
Irving, TX 75039

PROJECT: **CSP 2122-005 Multi-Purpose
Stadium Additions & Renovations**
Midlothian Independent School District
Midlothian, Texas

BUDGET: **\$2,750,000.00**

PRE-PROPOSAL **Tuesday, October 19, 2021; 10:00 AM at the Midlothian Independent School District
Administration Building, 100 Walter Stephenson Rd, Midlothian, TX 76065.**
Representatives of the Architect, Owner and Consulting Engineers will be present at this meeting. All Offerors are encouraged to attend.

PROPOSAL DATE **Proposal Due: Tuesday November 2, 2021,**
2:00 PM AND TIME:

LOCATION OF **Midlothian Independent School**
District PROPOSAL **Administration Building**
OPENING: 100 Walter Stephenson
Rd Midlothian, TX 76065

Proposal Documents will be available after October 7, 2021. Qualified Offerors (General Contractors) may obtain a free electronic copy of the Drawings and Project Manual.

A link to the digital copies of the drawings and project manual may be obtained from the MISD Website and or Ms. Shana Volentine, e-mail: shana.volentine@misd.gs and Brian Harlan from Orcutt | Winslow, email: harlan.b@owp.com.

All proposals must be in the hands of the Owner no later than the time specified above. Please seal all proposals in duplicate in an envelope with the following information on the face of the envelope.

Name of Offeror (General Contractor)
**CSP 2122-005 Multi-Purpose Stadium Additions &
Renovations**
Midlothian Independent School District

The Owner reserves the right to reject any and all proposals and to waive any irregularities in the Competitive Sealed Proposal process. No proposal shall be withdrawn within 30 days after the proposal opening without the specific consent of the Owner.



PROPOSAL BOND: Not Applicable

PAYMENT BOND AND PERFORMANCE BOND: A Payment Bond and Performance Bond, each in an amount equal to 100 percent (100%) of the Contract Sum conditioned upon the faithful performance of the Contract will be required. Please note that all bonding companies presented must be acceptable to the Owner.

The prevailing rates of wages are the minimums that must be paid in conformance with all applicable laws of the State of Texas.

All Offerors submitting a proposal are encouraged to attend the proposal opening. Subcontractors and suppliers intending to submit proposals to Construction Offerors are required to prepare their proposals based on a complete set of proposal documents. If after reviewing the complete set of proposal documents, Subcontractors and supplier Offerors desire to purchase individual drawings and specification sections for their proposal convenience, they may do so by ordering the specific drawings and specifications directly from the reproduction company.

All Offerors submitting a proposal are encouraged to visit the site.

END OF DOCUMENT



INSTRUCTIONS TO PROPOSERS

EXAMINATION OF DOCUMENTS AND SITE

- Each proposer, by making his Proposal, represents that he has read and understands the Proposal Documents. Failure to do so may be materially non-responsive and result in non-consideration of the bid.
- Each proposer, by making his Proposal, represents that he has visited the site, performed investigations and verifications as necessary and familiarize himself with the local conditions under which the Work is to be performed and will be responsible for errors in his proposal resulting from his failure to do so.
- Each proposer by making his proposal represents that his proposal is based upon the materials, systems and equipment required by the Proposal Documents without exception.
- Any and all site visits shall be coordinated through:

Rola Fadel
Midlothian ISD
Director of Architecture & Facilities
Email: rola.fadel@misd.gs

QUESTIONS

- Proposers shall submit questions about the Proposal Documents to the MISD Purchasing Department in writing by the date identified in the proposal. Replies will be issued to proposers as an addendum to the Proposal Documents and shall become a part of the Contract. The Architect and Owner will not be responsible for oral clarification.
- Submit all questions to: **Shana Volentine**
Midlothian ISD
Purchasing Agent
Email: shana.volentine@misd.gs

SUBSTITUTIONS

- Each proposer represents by submitting his proposal that his proposal is based upon the materials and equipment described in the proposal documents

STATUTORY PERFORMANCE BOND AND STATUTORY LABOR AND MATERIAL PAYMENT BOND

- A Statutory Performance Bond and a Statutory Labor and Material Payment Bond will be required of the successful proposer and shall be executed by a surety company acceptable to the Owner and authorized to do business in the State of Texas. Each bond shall be in an amount equal to one hundred percent (100%) of the contract price. The Performance Bond and the Labor and Material Payment Bond may be in one or separate instruments in accord with local law and are to be delivered to the Owner no later than the date of execution of the contract. Failure or neglecting to deliver said bonds, as specified, shall be considered as having abandoned the contract and the proposal security will be retained as liquidated damages.
- Bonds shall be executed by a Surety Company that is:
 - Approved by the school district, and duly authorized and admitted to do business in the State of Texas as determined by the State Board of Insurance.
 - Listed by the United States Department of the Treasury in that issue of the "Federal Register" covering the date on which the bond was executed and the date that Surety Company has obtained reinsurance, if applicable, from a reinsurer that is authorized and admitted as a reinsurer in this state and is the holder of a certificate of authority from the United States secretary of the treasury.

CERTIFICATE OF LIABILITY INSURANCE

- The successful proposer shall provide a Certificate of Liability Insurance in at least the amount of \$1,000,000.00. The Midlothian Independent School District shall be listed as additional insured.

MODIFICATION AND WITHDRAWAL

- No proposal may be changed, amended or modified after submittal. Proposers may withdraw proposals prior to proposal opening.
- No right or interest in this contract or delegation of any obligation shall be assigned by the vendor to another vendor. Any attempted assignment or delegation by the vendor shall be wholly void and totally ineffective for all



purposes.

SUBMITTAL

- Submit proposals in accordance with the Request for Proposals.
 - Enclose the proposal in an opaque, sealed envelope. Clearly mark on the outside of the proposal envelope: Project name
Name of proposer
Midlothian Independent School District
- Preparation of Proposals: Proposals shall be submitted on unaltered proposal forms. Fill in all blank spaces. If there are entries (blank spaces) on the proposal form which do not apply to a particular proposer, these entries shall be marked "N.A." (Not Applicable) by the proposer. No proposals will be considered that are amended or are qualified with conditional clauses, alterations, items not called for in the proposal, or irregularities of any kind which, in the Owner's opinion, may disqualify the proposer.
- Proposals meeting the requirements of the CSP shall be considered. Respondents taking exception to the specifications or offering substitutions shall state these exceptions.
- Each proposer shall submit one original, one duplicate copy, and one digital copy saved on a USB Flash Drive of each of the following. All shall be submitted in a single sealed envelope. Electronic signatures are acceptable.:
 - Checklist for CSP 2122-005 (Reference form attached to the end of this Section)
 - Proposer Identification: Contractor shall add a Cover Sheet/Proposer Identification Form that includes the following information:
 - Date
 - Company Name
 - Full Address
 - Phone #
 - Email Address
 - Proposal Form
 - Proposer shall note any contract deviations. Midlothian Independent School District can consider such deviations but is not obligated to accept such deviations
 - CSP Response Form Page 1 and Page 2
 - SB 9 Contractor Certification: Contractor Employees
 - Reference Sheet
 - Felony Conviction Notice (Reference form attached to the end of this Section)
 - 1295 Certificate of Interested Parties - This form must be completed online, printed and signed. (Reference form attached to the end of this Section)
 - Conflict-of-interest Questionnaire (Reference form attached to the end of this Section)
 - Non-collusion & Non-Discrimination Form (Reference form attached to the end of this Section)
 - HB 89/SB 252 Certification Form (Reference form attached to the end of this Section)
 - Any other information that responds to the Selection Criteria listed.
 - Each proposer shall submit one original, one duplicate copy, and one digital copy saved on a USB Flash Drive listing the subcontractors to be acquired for this project.
- Proposals received in the District's Business Office after the date and time specified will not be considered. The District is not responsible for lateness or non-delivery of mail carrier, etc., and the date/time stamp in the Business Office shall be the official time of receipt. Proposals **MAY NOT** be submitted by facsimile or email.
- Pricing submitted on this proposal is firm for a period of **60 Days** from the proposal opening date.
- The person signing the proposal should show the title that gives the authority to bind the firm to a contract.

DETERMINATION OF SUCCESSFUL RESPONDENT AND AWARD OF CONTRACT

- In determining the Selected Offeror, the Owner will evaluate the information derived from the Offeror's (Contractor's) Qualification Statement required herein, the information submitted on the Proposal Form, and other selection criteria including the following Selection Criteria:

COST	25 POINTS	The purchase price will be scored mathematically as a ratio
REPUTATION	10 POINTS	The reputation of the Proposer's goods and services. Items



		considered: Proposer's past relationships with and input from provided project references regarding recommendation of the Proposer, the Proposer's performance as a team player and their ability to work with the Owner on Change Orders and Contingency Allowances.
QUALITY	10 POINTS	The quality of the Proposer's goods and services. Items considered: - Proposer's past performance with input from provided project references regarding the Proposer's quality of craftsmanship - All required items submitted - Information provided in the proposal is clear
EXPERIENCE	15 POINTS	The Proposer's overall experience as well as past record of completing similar size and scope of projects on time. Items considered: - Number of years in business - Number of similar size projects within the past five years - Number of similar scope projects within the past five years – project scope must include working on an existing, operational campus maintaining full functionality. - Proposer's past performance with input
WARRANTY WORK	10 POINTS	The Proposer's response to warranty work requests. Items considered: Proposer's past performance with input from provided project references regarding the ability to perform warranty work in a timely manner.
PROJECT CLOSEOUT	10 POINTS	The Proposer's record of closing out projects expeditiously. Items considered: Proposer's past performance with input from provided project references regarding the closeout process duration.
PROJECT TEAM	15 POINTS	Qualifications of the proposed project manager(s) and project superintendent (s). Items considered: - Time in the construction industry for each individual - Number of K-12 school projects completed by each individual - Time with company for each individual
PROJECT SCHEDULE	5 POINTS	The Proposer's anticipated construction schedule. Items considered: start date, substantial completion date, final completion date, and total construction duration in calendar days.

- The district does not award/purchase on the basis of low bid alone.
- The District may choose to conduct interviews with proposers as part of the evaluation and selection process. If interviews are necessary will be held at:
Midlothian Independent School District Administration building
100 Walter Stephenson Rd
Midlothian, TX 76065.
- The Selection Committee consisting of Midlothian ISD administrators, architects, consultants and other staff will make an initial evaluation of the proposals. The committee's recommendation will be considered by the Midlothian ISD Board of Trustees ("Board"). The District reserves the right to review the recommendation with others deemed appropriate by the District prior to review by the entire Board. The final decision-making authority on the proposals rests with the full Board.
- The District will make such investigations as it deems necessary to determine the ability of the Offeror to perform the Work, and the Offeror shall furnish all such information and data for this purpose as may be requested. The District reserves the right to reject any proposal if the evidence submitted by, or investigation of, such Offeror fails to satisfy the District that such Offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.
- The District reserves the right to reject any or all proposals and to waive any formalities or irregularities and to make the award of the contract in the best interest of the District. The District also reserves the right as a sole judge of quality and equality.
- A decision regarding determination of the successful Offeror will be made by the District as soon as practical.
- If awarded, the successful vendor(s) will be notified by authorized District personnel.



EXECUTION OF CONTRACT

- The Owner reserves the right to accept any proposal, to reject any and all proposals, or to negotiate contract terms with the various proposers, when such is deemed by the Owner to be in his best interest.
- Notwithstanding delays in the preparation and execution of the formal contract agreement, each proposer shall be prepared, upon written notice of proposal acceptance, to commence work on or before a date stipulated in an official written order of the Owner to proceed.
- The accepted proposer shall assist and cooperate with the Owner in preparing the formal contract agreement, and within 5 days following its presentation shall execute the same and return it to the Owner.
- Form for the contract agreement will be AIA Document A101, Standard Form of Agreement Between Owner and Contractor, Stipulated Sum, 2017 Edition.
- The district limits its purchases through the use of properly drawn and authorized purchase orders. Consequently, the District is not responsible for items delivered or picked up and/or services that were not authorized via this method. Therefore, the purchase order number shall appear on ALL itemized invoices and packing slips to ensure payment.
- This contract, once accepted, will include the period agreed upon between the District and the vendor(s) to complete the projects listed in the CSP. Any purchase order dated and issued within these dates will be subject to the terms and conditions of this contract.
- If, at any time, the vendor fails to fulfill or abide by the terms, conditions, or specifications of the contract, the District reserves the right upon written notice to the vendor to the following remedies (though not just limited to these): purchase the products/services elsewhere and/or cancel the contract.
- Proposals may not be withdrawn without written approval after a contract has been signed or a purchase order executed or after a partial performance of the proposal agreement has begun.
- The District reserves the right to utilize other District contracts, State of Texas contracts, contracts awarded by other governmental agencies, other school boards, or other cooperative agreements in lieu of any offer received or award made as a result of this proposal, if it is in the District's best interest to do so.

PAYMENT

- The title and risk of loss of the goods/services shall not pass to the District until the District actually takes possession of the goods/services at either the point of sale or the point of delivery.
- On purchase order contracts – itemized invoices shall be issued for only those items/services received. Payment shall not be due until the invoice(s) are submitted after delivery. Pursuant to Texas Government Code 2251.021, payments will be made within thirty (30) days. Invoices shall be mailed directly to:

MISD Business Office

100 Walter Stephenson Rd.

Midlothian, TX 76065

Attn: Accounts Payable

Or

Email to: accounts_payable@misd.gs

TIME OF COMPLETION AND LIQUIDATED DAMAGES

- The contract date will be established as the number of consecutive calendar days as set out on the proposal form from the "Notice-to-proceed" date issued by the Owner.
- Failure of the Contractor to complete the Work by the contract date will result in damages being sustained by the Owner. Such damages are, and will continue to be, impracticable and extremely difficult to determine. Due consideration will be given to delays as outlined in the Contract.
- The Contractor will pay the Owner the amount indicated on the Proposal Form and in the General Conditions for each calendar day of delay in finishing the Work in excess of time specified for completion, plus authorized time extensions. Execution of the Contract under these specifications shall constitute agreement by the Owner and Contractor that the amount indicated is the minimum value of the costs and actual damage caused by failure of the Contractor to Substantially Complete the Work within the allotted time, that such sum is Liquidated Damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

SALES TAX EXEMPTION

- The Owner qualifies for exemption from State and Local Sales Taxes as set forth in the Supplementary Conditions. Tax exemption certificates will be issued upon request.

**TERMINATION OF CONTRACT**

- The requirements of Government Code, Chapter 552, Subchapter J - Additional Provisions Related to Contracting Information, applies to this contract and the contractor or vendor agrees that the contract can be terminated if the contractor or vendor knowingly or intentionally fails to comply with a requirement of that subchapter.
- Each respondent must give notice to the District if a person, owner or operator of the business has been convicted of a felony. The District determines that the person or business failed to give such notice or misrepresented the conduct resulting in the conviction.
- Respondents shall note any and all relationships that might be a Conflict of Interest and include such information with the Proposal.
- Please note that a gift to a public servant is a Class A misdemeanor offense if the recipient is a government employee who exercises any influence in the purchasing process of the governmental body. This would certainly apply to anyone who helps establish specifications or is involved in product selection or directs a purchase.

PROHIBITION ON CONTRACTS WITH COMPANIES BOYCOTTING ISRAEL

- Pursuant to Texas Government Code Chapter 2271, if this contract is valued at \$100,000 or more and if Contractor has at least ten (10) full time employees, then Contractor represents and warrants to the Owner that the Contractor does not boycott Israel and will not boycott Israel during the term of this Contract. This section does not apply to a sole proprietorship. On April 25, 2019, the U.S. District Court for the Western District of Texas entered a preliminary injunction enjoining the enforcement of Chapter 2271 as it existed before the amendment in any state contract. In compliance with the Court's order, the Owner will not seek enforcement of the current Chapter 2271 until further order of this or higher court having jurisdiction over the issue.

ADDITIONAL TERMS AND CONDITIONS

- Delivery of services will be made during normal working hours unless prior approval has been obtained.
- The successful proposer shall possess and maintain criminal background checks for all personnel working on District Property.
- MISD reserves the right to purchase additional services as listed on this proposal subject to the verification of the same or lower prices and conditions as the proposal.
- MISD also reserves the right to waive minor technicalities or formalities considered in the best interest of the district.
- In case of discrepancies within the drawings, within the specifications, or between the drawings and specifications, the better quality and greater quantity, shall be furnished and installed.

END OF DOCUMENT



BASE PROPOSAL FORM
CSP/RFP 2122-005 Multi-Purpose Stadium Additions &
Renovations

PROJECT: Multi-Purpose Stadium Additions & Renovations
Midlothian Independent School District
Midlothian TX

PROPOSAL OF: _____
(Name of Offeror) (Date)

TO: Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, TX 76065

Dear Sir/Madam:

Having examined the drawings, project manual, and related documents and having inspected the site of proposed work, I (we) agree to furnish all labor, materials, and to perform all work described in the specifications and shown on the drawings in the sum of:

BASE PROPOSAL:

_____ DOLLARS
(\$ _____).

Alternate No. 01 - Stadium Concrete and Fencing Repairs:

_____ DOLLARS
(\$ _____).

Alternate No. 02 - Stadium Bleachers and Restroom Renovations:

_____ DOLLARS
(\$ _____).

Alternate No. 03 - Pressbox Control Room:

_____ DOLLARS
(\$ _____).

Alternate No. 04 - Straight Shaft Piers at the Athletic Office Building:

_____ DOLLARS
(\$ _____).



Alternate No. 05 - Moisture Conditioning of the Soil at the Athletic Office:

_____ DOLLARS
(\$ _____).

Alternate No. 06 - Shallow Foundation at the Athletic Office Building:

_____ DOLLARS
(\$ _____).

NOTE: Amounts shall be shown in both words and figures. In case of discrepancy, the amount shown in words shall govern.

SCHEDULE

The overall schedule is critical to the success of this project. Contractor shall bid the time for substantial completion and final acceptance and the additional time for the specified alters in the spaces provided above. The project schedule is as follows:

Anticipated Board Approval:	December 13, 2021
Anticipated Notice to Proceed:	December 14, 2021
Substantial Completion:	July 29, 2022
Project Final Completions:	30 days after Substantial Completion

Respectfully Submitted

Company / Entity Name

By: _____

Printed Name

Title

Address

Phone Number

Email



Note: Affix seal and authorization if bidder is a corporation.

In the event an award of a contract to the undersigned, the undersigned will (1) furnish a performance and payment bond for full amount of the contract as specified herein, (2) secure proper compliance with the terms and provisions of the contract, (3) insure and guarantee the work until final completion and acceptance and (4) guarantee payment of all



lawful claims for labor performed and materials furnished in the fulfillment of the contract.

The work proposed shall be accepted when the District is satisfied that work is fully completed and finished in accordance with the plans and specifications.

The undersigned certifies that the bid prices contained in the proposal have been carefully checked and are submitted as correct and final.

Receipt is hereby acknowledged for the following addenda to bid proposal:

Addendum No. 01 Dated: _____ Received: _____

Addendum No. 02 Dated: _____ Received: _____

Addendum No. 03 Dated: _____ Received: _____

Addendum No. 04 Dated: _____ Received: _____

SECTION 00 3132

GEOTECHNICAL DATA

PART 1 GENERAL

1.1 GENERAL

- A. On behalf of the Owner, a subsurface investigation has been made by:

David Lutz, Fugro Consultants
Report Number 0704-1252, dated September 23, 2004.
- B. The data on indicated subsurface conditions are not intended as representations or warranties of the continuity of such conditions. It is expressly understood that the Owner/Architect/Structural Engineer will not be responsible for interpretations or conclusions drawn therefrom by the Bidder. The data is made available for the convenience of the Contractor.
- C. The Contractor shall examine the site. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner.
- D. Copies of the Geotechnical Report are available for inspection through the Soils Engineer.
- E. The Contractor shall become familiar with the Geotechnical Report and perform the work in conformance with the recommendations contained therein unless more stringent requirements are indicated elsewhere in the Contract Documents, in which case the more stringent requirements shall apply.
- F. Conflicts, inconsistencies, etc., in the Report or between the Report and the Contract Documents shall be brought to the attention of the Architect promptly.

END OF SECTION

SECTION 00 4325

SUBSTITUTION REQUEST FORM (PRIOR TO BID)

PART 1 GENERAL

- 1.1 When a specific product is specified for use in the project, it is to establish a standard of quality and shall not be construed as limiting competition. It is the Architect's and Engineers' intent that "Substitutions Prior to Bid" match the specified product, system, equipment or material criteria including, but not limited to, color, texture, size, weight, utility hook-up requirements, capacity, volume, speeds, power, BTU's, etc.
- 1.2 This project is to include only the products, materials, equipment and systems that are indicated on the Drawings, and are specified or approved prior to the Bid through the "Substitution Prior to Bid" (Prior Approval) process. Requests for "Substitution Prior to Bid" shall contain sufficient information, descriptive brochures, drawings, samples or other data as is necessary to provide direct comparison to the specified materials. When a manufacturer is designated in the Specification as an "Approved Equal" but no specific product is identified, Manufacturer's Representative shall demonstrate to the Architect and Engineer that the proposed product complies in every aspect with the specified product.
- 1.3 Products proposed as "Approved Equals" must be fully compared to the product, material, equipment or system specified. At the time he submits his product literature, the Contractor shall thoroughly review and compare the Specifications for both the specified item and proposed "Substitution Prior to Bid", and clearly identify in writing to the Architect and Engineer, any differences between the items. Differences that are to be identified shall include, but not be limited to, size, weight, utility hook-up requirements, volume, capacity, speeds, power, BTU's, etc. Should the Architect and Engineer deem any differences to be unacceptable, the "Request for Substitution Prior to Bid" shall be rejected.
- 1.4 All requests for substitution prior to bid shall be accompanied by a Request for Substitution Prior to Bid Form, that is a part of this Specification section. Requests not accompanied by the Form will not be reviewed. Requests for Substitution Prior to Bid shall be in the hands of the Architect no later than fourteen (14) calendar days prior to bid date.
- 1.5 Each submittal shall be well marked and identified as to types and kind of the items being submitted for approval. It is the sole responsibility of the Contractor to submit complete descriptive and technical information to the Architect so the Architect can make proper appraisal. Lack of proper information will be sufficient cause for rejection. Reference to catalogs will not be acceptable unless catalog is submitted with Substitution Request Form. All pertinent information shall be clearly marked by the Contractor and shall be specific to the product in question.
- 1.6 It is the Contractor's responsibility to confirm and correlate quantities and dimensions and coordinate with trades whose work may be affected by the requested substitution.
- 1.7 In submitting a Request for Substitution, the Manufacturer/Supplier shall make the following representations:
 - A. The proposed product is equal or superior in all respects to that specified.
 - B. The Substitution carries the same or better Warranty as the specified product, materials, equipment or system.

- C. Installation of the accepted Substitution shall be incorporated into the Work, making such changes as may be required for the Work to be completed in every respect, at no additional cost to the Owner.
- D. Claims for additional costs related to the Substitution that subsequently become apparent shall be waived by all parties.

- 1.8 If, at any time, any differences in the performance or physical characteristics of the proposed substitution are determined to be a liability to the performance, operation or design intent of the building, the Contractor shall be required to replace said product, material, equipment or system with the originally specified product at Contractor's expense, as well as compensate the Owner for any costs associated with the substituted product, material, equipment or system.

PART 2 MATERIALS – Not Used

PART 3 EXECUTION – Not Used

SUBSTITUTION OF MATERIALS PRIOR TO BID REQUEST FORM

NOTE: Requests for substitutions shall be in the hands of the Architect no later than fourteen (14) calendar days, prior to bid date.

TO: _____

PROJECT: _____ BID DATE: _____

We submit for your consideration the following product instead of the specified item for the above project:

Section	Page/Sheet No.	Paragraph/Line	Specified Item
_____	_____	_____	_____

Proposed Substitution: _____

Attach complete product description, drawings, photographs, performance and test data, available colors/finishes, and other information necessary for evaluation. Identify specific model numbers, finishes, options, etc.

- A. Will changes be required to building design or any components or assemblies in order to properly install and operate proposed substitution? Yes _____ No _____.
If yes, explain:

- B. The Manufacturer/Supplier, understands that he will pay for changes to the building design, including engineering and drawing costs, caused by requested substitution.

- C. List description of the difference proposed for each substitution and specified item.

Specified Item

Proposed Substitution

- D. Does substitution affect Drawing clearance and/or dimensions? Yes _____ No _____

If yes, explain: _____

- E. What effect does substitution have on other trades? List affected trades. _____

- F. Does manufacturer's warranty of proposed substitution differ from that specified?
Yes _____ No _____ If yes, explain: _____

- G. Will substitution affect progress schedule? Yes _____ No _____ If yes, explain:

- H. Will substitution require more license fees or royalties than specified product?
Yes _____ No _____ If yes, explain: _____

- I. Will maintenance and service parts be locally available for substitution?
Yes _____ No _____ If no, explain: _____

- J. Will substitution require additional testing, inspection, certification or approvals?
Yes _____ No _____ If yes, explain: _____

In submitting this "REQUEST FOR SUBSTITUTION OF MATERIALS PRIOR TO BID" the Manufacturer/Supplier represents the following:

1. The proposed product is equal or superior in all respects to that specified
2. The Substitution carries the same or better Warranty as the specified product, materials, equipment or system.
3. Installation of the accepted Substitution shall be incorporated into the Work, making such changes as may be required for the Work to be completed in every respect, at no additional cost to the Owner.
4. Claims for additional costs related to the Substitution that subsequently become apparent shall be waived by the Manufacturer/Supplier.
5. Cost data is complete and includes related costs under the Contract but excludes costs under separate contracts and design consultant's redesign.
6. If, at any time, any differences in the performance or physical characteristics of the proposed "Substitutions Prior to Bid" and are determined to be a liability to the performance, operation or design intent of the building, the Manufacturer/Supplier shall be required to replace said product, material, equipment or system with the originally specified product at Manufacturer/Supplier expense, as well as compensate the Owner for any costs associated with the substituted product, material, equipment or system.

Submitted by:

Signature

Firm

Address

Date

Telephone

Fax

Email

For Architect's Use Only:

____ Accepted ____ Accepted as Noted

____ Not Accepted ____ Received too Late

By _____

Date _____

Remarks _____

For Engineer's Use Only:

____ Accepted ____ Accepted as Noted

____ Not Accepted ____ Received too Late

By _____

Date _____

Remarks _____

END OF SECTION

SECTION 00 6290

ELECTRONIC DATA TRANSFER TERMS AND CONDITIONS

By accepting, transmitting, storing, duplicating, disseminating or otherwise utilizing any electronic drawings, models, or data (individually and collectively, "**Electronic Data**") which was originally generated or distributed by THE ORCUTT/WINSLOW LIMITED LIABILITY LIMITED PARTNERSHIP, an Arizona limited partnership, and/or its affiliates, owners, subsidiaries, agents or consultants (collectively, "**Orcutt I Winslow**"), the recipient ("**Receiving Party**") shall be deemed to signify its assent and agreement to be bound by these Electronic Data Transfer Terms and Conditions (these "**Conditions**"), and shall be deemed to agree that all such Electronic Data are instruments of service of Orcutt I Winslow, and that Orcutt I Winslow shall be deemed to be the author and owner of such Electronic Data and shall retain all common law, statutory law and other rights therein, including, without limitation, all related copyrights.

It is the responsibility of the Receiving Party to fully understand the building(s) (or other structural components) in terms of vertical relationships, structural components, and building systems by way of the applicable contract documents provided by Orcutt I Winslow. Any use of, or reliance on the Electronic Data shall be at Receiving Party's sole risk and without liability to Orcutt I Winslow. Any information contained within the Electronic Data provided is complementary to all other documents and as such is therefore inherently incomplete in terms of information provided. Any information provided electronically that is not in conformity with other contract documents provided by Orcutt I Winslow shall be brought to the attention of Orcutt I Winslow for clarification prior to proceeding with design or construction, and Receiving Party's failure to do so shall be deemed to constitute Receiving Party's waiver of its right (if any) to make any claim for compensation due to errors or omissions in said documents.

The Electronic Data is provided for the Receiving Party's convenience and does not constitute a legally binding document or agreement. Receiving Party shall not use the Electronic Data, in whole or in part, for any purpose or project other than the specific project for which it was created. Receiving Party hereby waives all claims against Orcutt I Winslow resulting in any way from or in connection with any unauthorized changes or use of the Electronic Data for any other project or by anyone other than Orcutt I Winslow.

To the fullest extent permitted by law, Receiving Party shall indemnify and hold Orcutt I Winslow harmless for, from and against any damage, liability or cost, including reasonable attorneys' fees and costs of defense, arising from or in connection with any changes to Electronic Data made by anyone other than Orcutt I Winslow or from any reuse of the Electronic Data without prior written consent of Orcutt I Winslow.

Due to varying environmental and storage conditions, integrity of electronic media and data are inherently subject to corruption. Orcutt I Winslow makes no warranties, either express or implied, of merchantability and/or fitness of the Electronic Data for any particular purpose, and hereby expressly disclaims all such warranties.



AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the _____ day of _____ in the year
TWENTY-_____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Midlothian Independent School District, a public school district and political subdivision
of the State of Texas
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5000
Fax: 972-775-1757
E-mail: rola.fadel@misd.gs

and the Contractor:
(Name, legal status, address and other information)

_____, a _____ of the State of _____
[Address]
[Address continued]
Phone: _____
Fax: _____
E-mail: _____

for the following Project:
(Name, location and detailed description)

2122-005 Stadium Additions & Renovations
1800 South 14th Street
Midlothian, Texas 76065

The Architect:
(Name, legal status, address and other information)

Orcutt Winslow
2929 N Central Avenue, 11th Floor
Phoenix, AZ 85012
Phone: 602-257-1764
E-mail: harlanb@owp.com

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "TM" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Kyle & Robinson P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

ARTICLE 1 THE CONTRACT DOCUMENTS

§ 1.1 The Contract Documents consist of this Agreement, General Conditions of the Contract, Supplementary Conditions and other Conditions and Project Manual to the extent they are consistent with other portions of the Contract Documents), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. The order of precedence of the Contract Documents shall be as set out in Section 1.2.4 of the AIA Document A201-2017.

§ 1.2 The Board of Trustees, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into or amend a contract, to approve changes in the scope of the Work, to approve and execute a Change Order or construction Change Directive modifying the Contract Sum, or to agree to an extension to the date of Substantial or Final Completion or to terminate a contract. The Owner designates the following as the individual authorities to sign documents on behalf of the Board of Trustees, following appropriate Board action: Superintendent or other Board designee.

§ 1.3 The Board designates the authorized representatives identified in Paragraph 8.3 to act on its behalf in other respects.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

- ☐ The date of this Agreement.
- ☐ A date set forth in a notice to proceed issued by the Owner.
- ☒ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

The commencement date will be the first business day after the Contractor's receipt of the written notice to proceed. The notice to proceed shall not be issued by Architect until the Agreement has been signed by the Contractor, approved by the Owner's Board of Trustees, signed by the Owner's authorized representative, and Owner and Architect have received all required payment and performance bonds and insurance, in compliance with Article 11 of the AIA document A201-2017. The anticipated date of the notice to proceed is December 14, 2021.

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

(Check one of the following boxes and complete the necessary information.)

- ☐ Not later than () calendar days from the date of commencement of the Work.
- ☒ By the following date: **July 29, 2022**

Init.

Final Completion shall be thirty (30) calendar days after the date of Substantial Completion, subject to adjustments of the Contract Time as provided in the Contract Documents.

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work

Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ AND ___/100 DOLLARS (\$ _____), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price
No. 01 - Stadium Concrete and Fencing Repairs	_____
No. 02 - Stadium Bleacher Additions and Renovations	_____
No. 03 - Pressbox Control Room.	_____

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
No. 01 - Owner's Contingency	\$100,000.00
No. 02 - Room Signage	\$5,000.00
No. 03 - Exterior Signage	\$5,000.00

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
Piers		

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a

Init.

penalty, the following per diem amounts commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work: ONE THOUSAND AND 00/100 DOLLARS (\$1,000.00).

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

§ 5.1.3 The Contractor shall submit monthly Applications for Payment to the Architect not later than the last day of each month, on AIA Form G702 for approval. Continuation sheets shall be submitted on AIA Form G703. The Architect will have seven business days to approve the Contractor's Application and submit its Certificate for Payment to the Owner. The Architect may require from the Contractor any additional information required by the Contract Documents and deemed necessary to substantiate the Application for Payment. The Owner shall pay to the Contractor, the certified undisputed amounts in the Payment Application to the Contractor not later than 30 days from the Owner's receipt of the Certificate of Payment from the Architect if the Owner's Board meets twice a month or more, and 45 days from the Owner's receipt of the Certificate of Payment from the Architect if the Owner's Board meets only once per month.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work, as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values;
- .2 If approved in advance by the Owner, that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017, or amounts certified by the Architect and disputed by the Owner; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five Percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:

(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:

(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon approval of its Board of Trustees and acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

§ 5.1.7.3

(Paragraphs deleted)

Retainage is not due to the Contractor until thirty-one (31) days after Final Payment for the Work as set out in Section 9.10 of AIA Document A201-2017.

§ 5.1.8 [Paragraph Deleted.]

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, shall not be made by the Owner to the Contractor until:

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment;
- .2 all conditions precedent to final payment have been fulfilled including those listed in Section 9.10.2 of the AIA Document A201–2017;
- .3 Contractor has submitted a signed document indicating consent of its Surety to Final Payment; and
- .4 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than thirty-one (31) days after the issuance of the Architect's final Certificate for Payment.

§ 5.3 Interest

(Paragraphs deleted)

Undisputed payments remaining unpaid under the Contract on the 31st day after the date the Owner receives a properly documented Certificate of Payment from the Architect are considered overdue and in accordance with the

Texas Prompt Payment Act, Texas Government Code Chapter 2251, shall bear interest from that date until the date that the Owner mails or electronically transmits payment, including accrued interest to that date.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document

(Paragraphs deleted)

A201–2017.

§ 6.2 Binding Dispute Resolution

For any Claim not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☒ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

§ 6.3 When Owner has an applicable claim for construction defects, Owner shall comply with the provisions of Texas Government Code Chapter 2272 related to the provision of notice of defects and the Contractor's or Architect's opportunity to cure.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1

(Paragraphs deleted)

[Paragraph Deleted.]

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

Rola Fadel
Director of Architecture & Facilities
Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5025
E-mail: rola.fadel@misd.gs

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

[Name]

[Title]

[Address]

[Address continued]

Phone: _____

Fax: _____

E-mail: _____

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A201™–2017, General Conditions of the Contract for Construction, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in Article 11 of the AIA Document A201™–2017, General Conditions of the Contract of Construction, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or *(Paragraphs deleted)* in any other format agreed to by the Owner, Contractor and Architect in writing.

§ 8.7 Other provisions:

§ 8.7.1 Pursuant to Texas Government Code Chapter 2271, as amended, if this contract is valued at \$1,000,000 or more and if the Contractor has at least ten (10) full time employees, then the Contractor, by its execution of this Agreement represents and warrants to the Owner that the Contractor does not boycott Israel and will not boycott Israel during the term of this Agreement. This section does not apply to a sole proprietorship.

§ 8.7.2 By signing this Agreement, the undersigned certifies as follows: Under Section 231.006 of the Texas Family Code, the Contractor certifies that the individual or business entity named in this Contract is not ineligible to receive the specified payments and acknowledges that this Contract may be terminated and payment withheld in this certification is inaccurate.

§ 8.7.3 Contractor verifies and affirms that it is not a foreign terrorist organization as identified on the list prepared and maintained by the Texas Comptroller of Public Accounts. If Contractor has misrepresented its inclusion on the Comptroller's list such omission or misrepresentation will void this Agreement.

§ 8.7.4 The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Contract and the Contractor agrees that the contract can be terminated if the Contractor knowingly or intentionally fails to comply with a requirement of that subchapter. Therefore, if the value of this Project is One Million Dollars (\$1,000,000.00) or more, the Contractor agrees to : (1) preserve all contracting information related to the contract as provided by the records retention requirements applicable to the Owner for the duration of the contract; (2) promptly provide to the governmental body any contracting information related to the contract that is in the custody or possession of the entity on request of the Owner; and (3) on completion of the contract, either: (a) provide at no cost to the Owner all contracting information related to the contract that is in the custody or possession of the entity; or (b) preserve the contracting information related to the contract as provided by the records retention requirements applicable to the Owner.

§ 8.7.5 Contractor shall take all actions and shall comply with all federal, state, and local legal requirements, and shall also comply with all recommendations of the Centers for Disease Control.

§ 8.7.6 Pursuant to Texas Government Code Chapters 2274 and 809, if this contract is valued at \$100,000 or more and if Contractor has at least ten (10) full-time employees, then Contractor represents and warrants to the Owner that the

Contractor does not boycott energy companies and will not boycott energy companies during the term of this Agreement. This provision does not apply to sole proprietorships.

§ 8.7.7 Pursuant to Texas Government Code Chapter 2274, if this contract is valued at \$100,000 or more and if Contractor has at least ten (10) full-time employees, then Contractor represents and warrants to the Owner that the Contractor does not discriminate against firearm entities or firearm trade associations and will not discriminate against firearm entities or firearm trade associations during the term of this Agreement. This provision does not apply to sole proprietorships.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 [Subsection Deleted.]
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

- .5 Drawings. The Drawings are those prepared by _____ dated _____ and which are listed in the Index of Drawings attached hereto as **Exhibit A**, which are incorporated herein by reference.

Number	Title	Date
--------	-------	------

- .6 Specifications. The Specifications are those prepared by _____ dated _____ and which are listed in the Table of Contents attached hereto as **Exhibit B**, which are incorporated herein by reference.

Section	Title	Date	Pages
---------	-------	------	-------

- .7 Addenda, if any:

Number	Date	Pages
--------	------	-------

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

- .8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

☐ The Sustainability Plan:

Title	Date	Pages
-------	------	-------

☐ Supplementary and other Conditions of the Contract:

Init.

Document	Title	Date	Pages
Not Applicable			

NOTE: Any Supplementary Conditions or other Conditions of this Contract listed above, the Project Manual or other terms or conditions attempted to be incorporated into this Contract, which contradict or conflict with the terms of this document or the terms and conditions set out in the AIA Document A201™–2017, General Conditions of the Contract for Construction shall be void and subordinate to the terms set out in the AIA Document A201™–2017, General Conditions of the Contract for Construction.

- .9** Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Exhibit A – Index of Drawings

Exhibit B – Table of Contents for Specifications

Owner's Request for Competitive Sealed Proposals (CSP) No. _____ dated _____.
 Contractor's Proposal dated _____.

This Agreement entered into as of the day and year first written above.

MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT	
OWNER (Signature)	CONTRACTOR (Signature)
Dr. Jo Ann Fey, Superintendent of Schools	
<i>(Printed name and title)</i>	<i>(Printed name and title)</i>

Additions and Deletions Report for AIA® Document A101® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 13:50:26 ET on 10/01/2021.

PAGE 1

AGREEMENT made as of the _____ day of _____ in the year TWENTY-

...

Midlothian Independent School District, a public school district and political subdivision of the State of Texas
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5000
Fax: 972-775-1757
E-mail: rola.fadel@misd.gs

...

_____, a _____ of the State of _____
[Address]
[Address continued]
Phone: _____
Fax: _____
E-mail: _____

...

2122-005 Stadium Additions & Renovations
1800 South 14th Street
Midlothian, Texas 76065

...

Orcutt Winslow
2929 N Central Avenue, 11th Floor
Phoenix, AZ 85012
Phone: 602-257-1764
E-mail: harlanb@owp.com

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NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "TM" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and

amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Kyle & Robinson P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

EXHIBIT A — INSURANCE AND BONDS



The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. § 1.1 The Contract Documents consist of this Agreement, General Conditions of the Contract, Supplementary Conditions and other Conditions and Project Manual to the extent they are consistent with other portions of the Contract Documents), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. The order of precedence of the Contract Documents shall be as set out in Section 1.2.4 of the AIA Document A201-2017.

§ 1.2 The Board of Trustees, by majority vote, is the only representative of the Owner, an independent school district, having the power to enter into or amend a contract, to approve changes in the scope of the Work, to approve and execute a Change Order or construction Change Directive modifying the Contract Sum, or to agree to an extension to the date of Substantial or Final Completion or to terminate a contract. The Owner designates the following as the individual authorities to sign documents on behalf of the Board of Trustees, following appropriate Board action: Superintendent or other Board designee.

§ 1.3 The Board designates the authorized representatives identified in Paragraph 8.3 to act on its behalf in other respects.

...

☒ Established as follows:

...

The commencement date will be the first business day after the Contractor's receipt of the written notice to proceed. The notice to proceed shall not be issued by Architect until the Agreement has been signed by the Contractor, approved by the Owner's Board of Trustees, signed by the Owner's authorized representative, and Owner and Architect have received all required payment and performance bonds and insurance, in compliance with Article 11 of the AIA document A201-2017. The anticipated date of the notice to proceed is December 14, 2021.

...

☒ By the following date: July 29, 2022

Final Completion shall be thirty (30) calendar days after the date of Substantial Completion, subject to adjustments of the Contract Time as provided in the Contract Documents.

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be (\$—), AND ___/100 DOLLARS (\$___), subject to additions and deductions as provided in the Contract Documents.

...

No. 01 - Stadium Concrete and Fencing Repairs	
---	--

No. 02 - Stadium Bleacher Additions and Renovations	_____
No. 03 - Pressbox Control Room.	_____

...

No. 01 - Owner's Contingency	\$100,000.00
No. 02 - Room Signage	\$5,000.00
No. 03 - Exterior Signage	\$5,000.00

...

Piers		
-------	--	--

...

If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the following per diem amounts commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work: ONE THOUSAND AND 00/100 DOLLARS (\$1,000.00).

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§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

month.

§ 5.1.3 ~~Provided that an Application for Payment is received by~~ The Contractor shall submit monthly Applications for Payment to the Architect not later than the day of a month, the Owner shall make payment of the amount certified last day of each month, on AIA Form G702 for approval. Continuation sheets shall be submitted on AIA Form G703. The Architect will have seven business days to approve the Contractor's Application and submit its Certificate for Payment to the Owner. The Architect may require from the Contractor any additional information required by the Contract Documents and deemed necessary to substantiate the Application for Payment. The Owner shall pay to the Contractor, the certified undisputed amounts in the Payment Application to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than () days after the Architect receives the Application for Payment.

~~(Federal, state or local laws may require payment within a certain period of time.)~~ 30 days from the Owner's receipt of the Certificate of Payment from the Architect if the Owner's Board meets twice a month or more, and 45 days from the Owner's receipt of the Certificate of Payment from the Architect if the Owner's Board meets only once per month.

...

- .1 That portion of the Contract Sum properly allocable to completed Work; Work, as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values;
- .2 ~~That~~ If approved in advance by the Owner, that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, ~~if approved in advance by the Owner,~~ suitably stored off the site at a location agreed upon in writing; and

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- 4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; A201–2017, or amounts certified by the Architect and disputed by the Owner; and

...

Five Percent (5%)

...

N/A

...

After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon approval of its Board of Trustees and acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

(Insert any other conditions for release of retainage upon Substantial Completion.)

Retainage is not due to the Contractor until thirty-one (31) days after Final Payment for the Work as set out in Section 9.10 of AIA Document A201-2017.

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.~~[Paragraph Deleted.]~~

...

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall not be made by the Owner to the Contractor when until:

- 1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment;
- 2 all conditions precedent to final payment have been fulfilled including those listed in Section 9.10.2 of the AIA Document A201–2017;
- 3 Contractor has submitted a signed document indicating consent of its Surety to Final Payment; and
- ~~2~~ 4 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than ~~30~~ thirty-one (31) days after the issuance of the Architect's final Certificate for Payment, or as follows:

Payment.

...

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

—%—Undisputed payments remaining unpaid under the Contract on the 31st day after the date the Owner receives a properly documented Certificate of Payment from the Architect are considered overdue and in accordance with the

Texas Prompt Payment Act, Texas Government Code Chapter 2251, shall bear interest from that date until the date that the Owner mails or electronically transmits payment, including accrued interest to that date.

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The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

A201–2017.

...

For any Claim ~~subject to~~, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

...

☒ [X] Litigation in a court of competent jurisdiction

...

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

§ 6.3 When Owner has an applicable claim for construction defects, Owner shall comply with the provisions of Texas Government Code Chapter 2272 related to the provision of notice of defects and the Contractor's or Architect's opportunity to cure.

...

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

[Paragraph Deleted.]

...

Rola Fadel
Director of Architecture & Facilities
Midlothian Independent School District
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5025
E-mail: rola.fadel@misd.gs

PAGE 8

[Name]

[Title]

[Address]

[Address continued]

Phone: _____

Fax: _____

E-mail: _____

...

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, ~~Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, A201™–2017, General Conditions of the Contract for Construction,~~ and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in ~~AIA Document A101™–2017 Exhibit A, Article 11 of the AIA Document A201™–2017, General Conditions of the Contract for Construction,~~ and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

in any other format agreed to by the Owner, Contractor and Architect in writing.

...

§ 8.7.1 Pursuant to Texas Government Code Chapter 2271, as amended, if this contract is valued at \$1,000,000 or more and if the Contractor has at least ten (10) full time employees, then the Contractor, by its execution of this Agreement represents and warrants to the Owner that the Contractor does not boycott Israel and will not boycott Israel during the term of this Agreement. This section does not apply to a sole proprietorship.

§ 8.7.2 By signing this Agreement, the undersigned certifies as follows: Under Section 231.006 of the Texas Family Code, the Contractor certifies that the individual or business entity named in this Contract is not ineligible to receive the specified payments and acknowledges that this Contract may be terminated and payment withheld in this certification is inaccurate.

§ 8.7.3 Contractor verifies and affirms that it is not a foreign terrorist organization as identified on the list prepared and maintained by the Texas Comptroller of Public Accounts. If Contractor has misrepresented its inclusion on the Comptroller's list such omission or misrepresentation will void this Agreement.

§ 8.7.4 The requirements of Subchapter J, Chapter 552, Government Code, may apply to this Contract and the Contractor agrees that the contract can be terminated if the Contractor knowingly or intentionally fails to comply with a requirement of that subchapter. Therefore, if the value of this Project is One Million Dollars (\$1,000,000.00) or more, the Contractor agrees to : (1) preserve all contracting information related to the contract as provided by the records retention requirements applicable to the Owner for the duration of the contract; (2) promptly provide to the governmental body any contracting information related to the contract that is in the custody or possession of the entity on request of the Owner; and (3) on completion of the contract, either: (a) provide at no cost to the Owner all contracting information related to the contract that is in the custody or possession of the entity; or (b) preserve the contracting information related to the contract as provided by the records retention requirements applicable to the Owner.

§ 8.7.5 Contractor shall take all actions and shall comply with all federal, state, and local legal requirements, and shall also comply with all recommendations of the Centers for Disease Control.

§ 8.7.6 Pursuant to Texas Government Code Chapters 2274 and 809, if this contract is valued at \$100,000 or more and if Contractor has at least ten (10) full-time employees, then Contractor represents and warrants to the Owner that the

Contractor does not boycott energy companies and will not boycott energy companies during the term of this Agreement. This provision does not apply to sole proprietorships.

§ 8.7.7 Pursuant to Texas Government Code Chapter 2274, if this contract is valued at \$100,000 or more and if Contractor has at least ten (10) full-time employees, then Contractor represents and warrants to the Owner that the Contractor does not discriminate against firearm entities or firearm trade associations and will not discriminate against firearm entities or firearm trade associations during the term of this Agreement. This provision does not apply to sole proprietorships.

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.2 ~~AIA Document A101™-2017, Exhibit A, Insurance and Bonds [Subsection Deleted.]~~

...

.5 Drawings. The Drawings are those prepared by _____ dated _____ and which are listed in the Index of Drawings attached hereto as **Exhibit A**, which are incorporated herein by reference.

...

.6 Specifications. The Specifications are those prepared by _____ dated _____ and which are listed in the Table of Contents attached hereto as **Exhibit B**, which are incorporated herein by reference.

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Not Applicable

NOTE: Any Supplementary Conditions or other Conditions of this Contract listed above, the Project Manual or other terms or conditions attempted to be incorporated into this Contract, which contradict or conflict with the terms of this document or the terms and conditions set out in the AIA Document A201™-2017, General Conditions of the Contract for Construction shall be void and subordinate to the terms set out in the AIA Document A201™-2017, General Conditions of the Contract for Construction.

(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™-2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

Exhibit A – Index of Drawings

Exhibit B – Table of Contents for Specifications

Owner's Request for Competitive Sealed Proposals (CSP) No. _____ dated _____.

Contractor's Proposal dated _____.

...

MIDLOTHIAN INDEPENDENT SCHOOL DISTRICT

...

Dr. Jo Ann Fey, Superintendent of Schools

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Elisabeth Nelson, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 13:50:26 ET on 10/01/2021 under Order No. 5048698191 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A101™ – 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

2122-005 Stadium Additions & Renovations
1800 South 14th Street
Midlothian, Texas 76065

THE OWNER:

(Name, legal status and address)

Midlothian Independent School District, a public school district and political subdivision of the State of Texas
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5000
Fax: 972-775-1757
E-mail: rola.fadel@misd.gs

THE ARCHITECT:

(Name, legal status and address)

Orcutt Winslow
2929 N Central Avenue, 11th Floor
Phoenix, AZ 85012
Phone: 602-257-1764
E-mail: harlanb@owp.com

THE CONTRACTOR

_____, a _____ of the State of _____
[Address]
[Address continued]
Phone: _____
E-mail: _____

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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15	CLAIMS AND DISPUTES

NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "TM" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Kyle & Robinson, P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, Project Manual and the Bid or Proposal Documents prepared and submitted by the Owner and the Contractor's Bid or Proposal submitted by the Contractor, to the extent they do not conflict with the terms of this Agreement, and other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements. The Contract Documents identified in this Section shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations. In the absence of individual signatures by Owner and Contractor, the Contract Documents identified in the signed contract prevail.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. After execution of the Original Contract Documents, the Contract may thereafter be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.1.9 The terms "bids" or "bidding" shall include any kind of competitive purchasing under the Texas Education Code Chapter 44 and Texas Government Code Chapter 2269.

§ 1.1.10 Miscellaneous Other Words

§ 1.1.10.1 Business Day

The term "business day" is a day the Owner's Administration Building is scheduled to be open for normal business purposes, unless closed by the Owner's Superintendent of Schools for inclement weather or other reason. Days on which the Administration Building is normally closed are Thanksgiving Break, Winter Break, Spring Break, and Summer Break, as well as other federal, state or local days specified in the calendar approved by the Owner's Board of Trustees on an annual basis. A business day does not include a day on which the Owner's Administration Building is open only for the purposes of conducting candidate filing, early voting, elections, or special events.

§ 1.1.10.2 Calendar Day

A calendar day is a day on the Gregorian calendar. The Contact Time is established in calendar days. Extensions of time granted, if any, will be converted to calendar days.

§ 1.1.10.3 Holidays

Owner approved holidays for Contractor's Work are limited to New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

§ 1.1.10.4 Work Day

Work days include all calendar days except Holidays, Saturdays and Sundays.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.2 During the course of the Work, should any conflict be found in or between the Contract Documents, the Contractor shall be deemed to have included in the cost of the Work the greater quantity or better quality, or the most stringent requirements, unless Contractor shall have obtained, before the submission of Contractor's Proposal, an interpretation in writing from the Architect as to what shall govern. The Architect, in case of such conflict, may interpret or construe the document so as to obtain the most substantial and complete performance of the Work consistent with the Contract Documents and reasonably inferable therefrom, in the best interests of Owner, and the Architect's interpretation shall be final. The terms and conditions of this clause shall not relieve any party of any other obligation under the Contract Documents.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 Precedence Of The Contract Documents

The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

- .1 Contract Modifications signed by Contractor and Owner.
- .2 Addenda, with those of later date having precedence over those of earlier date.
- .3 General Conditions - AIA Document A201-2017, as modified by the Owner for the Project.

- .4 Specifications and Drawings.
- .5 Agreement – AIA Document A101-2017, as modified by the Owner for the Project.
- .6 Bid/Proposal Documents including the Project Manual, Contractor's Bid or Proposal Documents (to the extent such Bid or Proposal submitted by the Contractor is part of the Contract Documents and is not inconsistent with other portions of the Contract Documents)

§ 1.2.5 Relation Of Specifications And Drawings

Specifications and Drawings are to be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the better quality and greater quantity of Work indicated. In the event of the above-mentioned disagreements, the resolution shall be determined by the Architect.

§ 1.2.5.1 Drawings and Specifications are to be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the better quality and greater quantity of Work indicated. In the event of the above-mentioned disagreements, the resolution shall be determined by the Architect.

§ 1.2.5.2 Where, in the Drawings and Specifications, certain products, manufacturer's trade names, or catalog numbers are given, it is done for the express purpose of establishing a standard of function, dimension, appearance, and quality of design, in harmony with the Work, and is not intended for the purpose of limiting competition. Materials or equipment shall not be substituted unless such substitution has been specifically accepted for use on this Project by the Architect.

§ 1.2.5.3 When the Work is governed by reference to standards, building codes, manufacturer's instructions, or other documents, unless otherwise specified, the current edition as of the Agreement date shall apply.

§ 1.2.5.4 Requirements of public authorities apply as minimum requirements only and do not supersede more stringent specified requirements.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are: (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered (whether actually received or not) when deposited with the United States Postal Service, postage prepaid, certified mail, return receipt requested, and addressed to the intended recipient at the address shown in this Agreement. Notice may also be given in person, by

mail, by courier, or by electronic transmission if a method for electronic transmission (e-mail or facsimile) or other commercially reasonable means and will under any of these circumstances, be effective when actually received. Any address for notice may be changed by written notice delivered as provided in this Section 1.6.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit or such other form agreed to by the parties, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance [Paragraph Deleted.]

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the Board of Trustees of the Midlothian Independent School District and is referred to throughout the Contract Documents as if singular in number. The Owner may designate in writing one or more persons to represent the Owner; however, such representatives shall have the authority to bind the Owner only to the extent expressly authorized by the Owner and shall have no implied authority. Except as otherwise provided in Section 4.2.1, the Architect does not have the authority to bind the Owner. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner may engage a third-party consultant to represent the Owner. The Owner will notify the Contractor of the identity of such consultant.

§ 2.1.3 The Contractor acknowledges that no lien rights exist with respect to public property.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Pursuant to the requirements of Texas Business and Commerce Code section 56.054(e)(3), the Owner represents that funds are available and have been authorized for the full contract amount of the Work.

§ 2.2.2 [Paragraph Deleted.]

§ 2.2.3 [Paragraph Deleted.]

§ 2.2.4 [Paragraph Deleted.]

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner may furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site, but shall have no duty to do so. Notwithstanding the foregoing, if the Owner provides such survey, the Contractor shall remain responsible to independently investigate the physical characteristics, legal limitations, and utility locations for the Project site. In the event that the Contractor

damages any utilities during construction, the Contractor shall immediately repair the same at its sole cost and expense.

§ 2.3.5 Information or services required of the Owner by the Contract Documents shall be furnished by the Owner within a reasonable time following actual receipt of a written request.

§ 2.3.6 The Contractor, Owner and Architect shall agree on an appropriate quantity of drawings and specifications to be printed and distributed for bidding purposes. The drawings shall be provided by the Architect and paid for by the Owner.

§ 2.3.7 Owner's personnel or consultant may, but are not required to be present at the construction site during progress of the Work to assist the Architect in the performance of his duties, and to verify the Contractor's record of the number of workmen employed on the Work, their occupational classification, the time each is engaged in the Work, and the equipment used in the performance of the Work for purpose of verification of Contractor's Applications for Payment.

§ 2.3.8 The Owner (either directly or by contract with the Architect) may furnish tests, inspections, and reports, required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 2.3.9 The Owner, (directly or by contract with the Architect), when such services are required, in the professional opinion of the Architect, shall furnish services of geotechnical engineers, which may include test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is defective or not in accordance with the requirements of the Contract Documents as required by Section 12.2, fails to timely carry out Work in accordance with the Contract Documents or is in default of any of its material obligations hereunder, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.. This right shall be in addition to, and not in restriction of, the Owner's right under Section 12.2.

§ 2.5 Owner's Right to Carry Out the Work

§ 2.5.1 If the Contractor is in default in any of its material obligations hereunder, neglects to timely carry out the Work in accordance with the Contract Documents, or fails to correct nonconforming or defective Work as required by Section 12.2, and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or such non-conforming or defective Work with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or such non-conforming or defective Work at the sole cost of the Contractor. The Architect may, pursuant to Section 9.5.1, withhold or nullify the Contractor's Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such default or such non-conforming or defective Work, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure to correct such non-conforming or defective Work. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.5.2 Nothing contained in this Section 2.5 is intended to limit or modify any obligations under the law or under the Contract Documents, including any warranty obligations, expressed or implied.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be authorized to do business in the state of Texas and lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this

Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative, or in the case of a Construction Manager-at-Risk, the Construction Manager-at-Risk, or its authorized representative.

§ 3.1.2 The Contractor shall perform the Work in a good and workmanlike manner and accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Owner or Owner's consultants, if applicable, conducted in accordance with the Contract Documents or activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including without limitation: (1) the location, condition, layout and nature of the Project site and surrounding areas, (2) generally prevailing climatic conditions, (3) anticipated labor supply and costs, (4) availability and cost of materials, tools and equipment, and (5) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site, or for price escalations in the marketplace. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to comply with the requirements of this Section.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. Contractor shall not perform any Work it knows involves an error, inconsistency, or omission without further instructions to Contractor or revised Construction Documents from the Architect. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the Work installed by other contractors, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other Work, it shall verify at the site all dimensions relating to such existing or other Work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the Work or honor its warranty, or will result in a limitation of or interference with the Owner's intended use, then the Contractor shall promptly notify the Architect and Owner, in writing providing substantiation for its position.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15; however, nothing in this section shall provide the Contractor with an affirmative claim for damages for delay by Owner or Architect, as such a claim is prohibited under this Contract. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the

Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 Notwithstanding the delivery of a survey or other documents by the Owner, Contractor shall use reasonable efforts to perform all Work in such a manner so as to avoid damaging any utility lines, cables, pipes, or pipelines on the property. Contractor shall be responsible for, and shall repair at Contractor's own expense, any damage done to lines, cables, pipes, and pipelines identified to Contractor.

§ 3.2.6 The Owner and Contractor agree that the Contract Documents may not be free from errors, inconsistencies, or omissions, and further agree that the Owner makes no warranty as to the completeness or accuracy of the Contract Documents, either express or implied. Execution of the Contract by the Contractor is a representation that the Contractor has thoroughly reviewed and become familiar with the Contract Documents and that the Contractor is not aware of any errors, inconsistencies or omissions in the Contract Documents which would delay the Contractor in the performance of the Contract Work. The Contractor shall not be entitled to any damages or increase in the Contract Amount due to delays or disruptions to the Work. This limitation on damages is further subject to the limitations set forth in Section 15.1.7.

§ 3.2.7 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's request for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.8 The Contractor shall use the AIA Document G716-2004 "REQUEST FOR INFORMATION" (RFI) form unless otherwise provided in the Contract Documents. The Contractor shall keep a log of all RFI's submitted and number the RFI's consecutively beginning with the number 1.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall assign a Superintendent who shall make decisions on behalf of the Contractor and its subcontractors. The Superintendent shall be on the Project, in this capacity, at all times while Work on the Project is in progress. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 Contractor shall bear responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, chapter C, Sections 756.021, *et seq.*, and shall require any applicable subcontractor to comply all such procedures. Trench excavation safety protection shall be a separate pay item, and shall be based on linear feet of trench excavated. Special shoring requirements shall also be a separate pay item, and shall be based on the square feet of shoring used.

§ 3.3.5 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent Contractor. Nothing contained herein or inferable herefrom shall be deemed or construed to (1) make Contractor the agent, servant, or employee of the Owner, or (2) create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner in respect of the Work shall relate to the results the

Owner desires to obtain from the Work, and shall in no way affect Contractor's independent contractor status as described herein.

§ 3.3.6 The Contractor shall review contractor safety programs, procedures, and precautions in connection with performance of the Work. However, the Contractor's duties shall not relieve any Subcontractor(s) or any other person or entity (e.g. a supplier) including any person or entity with whom the Contractor does not have a contractual relationship, of their responsibility or liability relative to compliance with all applicable federal, state and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. The foregoing notwithstanding, the requirements of this Section are not intended to impose upon the Contractor any additional obligations that the Contractor would not have under any applicable state or federal laws including, but not limited to, any rules, regulations, or statutes pertaining to the Occupational Safety and Health Administration.

§ 3.3.7 Contractor acknowledges that the Work may be performed in connection with an educational facility which is currently occupied and in use. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb, or disrupt Owner's normal operations or facilities. Contractor agrees to and shall comply with all rules, regulations and requirements of the Owner and the school campus on which the Work is to be performed, and shall take all steps necessary to protect and guard the safety of the employees, students and invitees of Owner. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. Contractor understands and accepts the difficulties and costs associated with working in an existing facility and the potential delays and disruptions in its Work and has included such items in the Contract Time and the Contract Sum. The Contractor shall perform all the Work in such a manner as to cause minimum interference with the operations of the Owner and other contractors and Subcontractors on the site, and shall take, and cause the Contractor's and its Subcontractor's employees, agents, licensees and permittees to take all necessary precautions to protect the Work and the site and all persons and property thereon from damage or injury.

§ 3.3.8 Representatives of the Owner, Contractor, and Architect shall meet periodically at mutually agreed upon intervals, for the purpose of establishing procedures to facilitate cooperation, communication, and timely responses among the participants. By participating in this arrangement, the parties do not intend to create additional contractual obligations or modify the legal relationships which may otherwise exist.

§ 3.3.9 The Contractor shall pay fees for public or private water, gas, electrical and other utility service at the site until Substantial Completion of the Work. In the event that the Work will be conducted at an Owner site, where utility services are existing on site and reasonably accessible to the Contractor, the Owner may elect, in writing, to provide and pay for utility service for the Project site. Agreement to pay for such utility service shall not absolve the Contractor from using utilities judiciously in connection with its performance of the Work. In all cases, the Contractor shall secure and arrange for all necessary utility connections.

§ 3.3.10 The Owner may require that the Contractor use and/or respond to certain Owner-furnished forms or inquiries during the course of the Project. From time to time, there may be future revisions, changes, additions or deletions to these forms. The fact that the Owner modifies and increases reasonable reporting requirements shall not serve as the basis for a claim for additional time or compensation by the Contractor.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for qualified, careful, and efficient workers and labor, eligible to work in accordance with state and federal law. Contractor shall appropriately classify all workers in accordance with the Fair Labor Standards Act, its implementing regulations, and Texas Labor Code Section 214.008. In addition, unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Before ordering any material or doing any Work, Contractor shall verify all dimensions and check all conditions in order to assure Contractor that they are the same as those in the Drawings, Specifications, and other Construction Documents. Any

inconsistency shall be brought to the attention of the Architect. In the event that discrepancies occur between ordered material and actual conditions and Architect was not notified beforehand, then costs to correct such discrepancies shall be borne by Contractor. In accordance with Texas Government Code §2269.054, these Contract Documents shall not be construed to deny or diminish the right of any person to work because of the person's membership or other relationship status with respect to any organization. In accordance with Texas Government Code §2269.0541, these Contract Documents shall also not prohibit, require, discourage or encourage a person, or discriminate against a person bidding on this contract from entering into or declining to enter into, or adhering to, an agreement with a collective bargaining organization relating to this Project.

(Paragraph deleted)

§ 3.4.2 Prevailing Wages

§ 3.4.2.1 The Project is subject to the Texas Government Code, Chapter 2258, Prevailing Wage Rates. This statute requires the Contractor and any Subcontractor to pay not less than the prevailing rates of per diem wages in the locality at the time of construction to all laborers, workmen, and mechanics employed by them in the execution of the contract.

§ 3.4.2.2 In accordance therewith, the Owner has established a scale of prevailing wages which is incorporated in the Project specifications, and not less than this established scale must be paid on the Project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the Work at the time of construction.

§ 3.4.2.3 A Contractor or Subcontractor who violates the provisions of Sections 3.4.1.1 or 3.4.1.2 shall pay to Owner the sum of Sixty Dollars and No/100 (\$60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rate stipulated in the scale of prevailing wages applicable to this Project, as required by Texas Government Code Section 2258.023(b).

§ 3.4.3 Substitutions

§ 3.4.3.1 If the Contract Documents (including the Instructions to Proposers and /or Offerors) specifically permit the submission by Contractor of requests for substitutions, Contractor may, within thirty (30) days after the Contract has been executed, make written request for the substitution of products in place of those specified in the Contract Documents to the Owner and the Architect. Any request for substitution shall be submitted to the Architect in writing, with appropriate shop drawings, product data, and certified test results substantiating the proposed product equivalence as required by this Section 3.4.3.1 and Section 3.4.3.2 and will be rejected if not so submitted.

§ 3.4.3.2 The Contractor must submit to the Architect and the Owner (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other information necessary for a complete evaluation of the substitution; (ii) a written explanation of the reasons the substitution is necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable; (iii) the adjustment, if any, in the Contract Sum; (iv) the adjustment, if any, in the time of completion of the Contract and any modifications to the construction schedule; and (v) an affidavit stating that (a) the proposed substitution confirms to and meets all the requirements of the pertinent Specifications and the requirements shown on the Drawings, (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect; (c) the cost breakdown presented with Contractor's request is complete and includes all related costs, except for the Architect's redesign costs, if any, and waives all claims for additional costs related to the substitution which subsequently become apparent; (d) that the Contractor will coordinate and supervise the installation of the proposed substitute, making such changes as may be required for the Work to be complete in all respects; and (e) the Contractor will reimburse the Owner and for review or redesign services associated with any re-approval by applicable governmental authorities related to the substitution.

§ 3.4.3.3 By making requests for substitutions pursuant to Section 3.4.3 (and all subsections), the Contractor represents and certifies that: (1) Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to the product specified; (2) Contractor will provide the same warranty for the substitution product that the Contractor would have provided for the product specified; (3) the cost breakdown presented with the request is complete and includes all related costs, except for the Architect's redesign costs, if any, and waives all claims for additional costs related to the substitution which subsequently become apparent; (4) Contractor will coordinate and supervise the installation of the proposed substitute, making such changes as may be required for the Work to be complete in all respects; and (5) will reimburse Owner and Architect for review or redesign services associated with any re-approval by applicable governmental authorities related to the substitution.

§ 3.4.3.4 Owner and the Architect may accept or reject any such request for substitution in their sole discretion, based on cost, time, or other considerations. Requests for substitutions submitted after such thirty (30) day period will not be considered unless a product becomes impossible to obtain due to circumstances beyond the Contractor's control.

§ 3.4.3.5 Regardless of acceptance or rejection of substitution, the Contractor shall be responsible for amounts paid by the Owner to the Architect, to evaluate the Contractor's proposed substitutions and any amounts paid to the Architect to make agreed upon changes in the Specifications and Drawings made necessary by the Owner's acceptance of such substitutions. The Owner shall be entitled to deduct such amounts from the Contract Sum.

§ 3.4.4 Responsibility for Subcontractors

§ 3.4.4.1 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. Contractor, its subcontractors and vendors shall bear responsibility for compliance with all federal, state and local laws, regulations, guidelines, and ordinances pertaining to worker safety and applicable to the Work. Contractor further recognizes that the Owner and Architect do not owe the Contractor any duty to supervise or direct his work so as to protect the Contractor from the consequences of his own conduct. THE CONTRACTOR RELEASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FOR CONTRACTOR'S FORCES; NON-COMPLIANCE WITH OWNER'S DRUG-FREE, ALCOHOL-FREE, WEAPON-FREE, HARASSMENT-FREE, AND TOBACCO-FREE ZONES; CONTRACTOR'S FORCES NON-COMPLIANCE WITH CRIMINAL LAW; OR CONTRACTOR'S OR CONTRACTOR'S FORCES NON-COMPLIANCE WITH IMMIGRATION LAW OR REGULATIONS. Any individual found by Owner to have violated these restrictions is subject to permanent removal from the Project, at Owner's request. Contractor shall place similar language in its subcontract agreements, requiring its Subcontractors and Sub-subcontractors to be responsible for their own forces and Contractor shall cooperate with the Owner to ensure Subcontractor and Sub-subcontractor compliance.

§ 3.4.4.2 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall be responsible for the actions of Contractor's forces, Subcontractor's forces and all tiers of Sub-subcontractor's forces. The Contractor recognizes that the Work may be performed in connection with an operational educational facility or the Project site may be adjacent to a public-school campus. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb or disrupt Owner's normal operations or facilities. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. Contractor understands and accepts the difficulties and costs associated with working at or near an operational campus and the potential delays and disruptions in its Work and has included such items in the Contract Time and the Contract Sum.

§ 3.4.5 Criminal History Records Checks

§ 3.4.5.1 Unless otherwise exempt from providing such information by any provision in Texas Education Code, Section 22.08341 (the "Statute"), the Contractor agrees, that prior to commencement of work under this Agreement, using the form promulgated by the Owner or such other form approved by the Owner, Contractor will arrange with the Owner to obtain any national criminal history record information ("CHRI") required pursuant to Texas Education Code, Section 22.08341 (the "Statute") on all of Contractor's employees, independent contractors, agents, or Subcontractors, Contractor's Subcontractors of every tier ("Subcontractors"), Subcontractors' employees, independent contractors, agents, or sub-subcontractors, if any of these persons is a "Covered Employee" as defined by the Statute, i.e. the person has or will have continuing duties related to the contracted for services, and said person has or will have the opportunity for direct contact with students in connection with those continuing duties and shall reimburse the Owner for the costs and expenses associated with obtaining the criminal history information. For purposes of this Section 3.4.5 a person does not have the opportunity for direct contact with students if:

- .1 the public work does not involve the construction, alteration, or repair of an improvement to real property, or a necessary fixture of an improvement to real property that is used predominantly for teaching the curriculum required by the Texas Education Code ("Instructional Facility");

2. for a public work that involves construction of a new Instructional Facility, the person's duties related to the contracted services will be completed not later than the seventh (7th) day before the first date the facility will be used for instructional purposes; or
3. for a public work that involves an existing Instructional Facility:
 - (a) the public work area contains sanitary facilities and is separated from all areas used by students by a secure barrier fence that is not less than six feet in height; and
 - (b) the Contractor adopts a policy prohibiting employees, including subcontractor entity employees, from interacting with students or entering areas used by students, informs employees of the policy, and enforces the policy at the public work area.

§ 3.4.5.2 Any Covered Employee that has during the preceding thirty (30) years, been convicted of one of the following offenses, if at the time of the offense the victim was under eighteen (18) or enrolled in a public school: (a) a felony offense under Title 5, Texas Penal Code; (b) an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) an equivalent offense to (a) or (b) under federal law or the laws of another state ("Disqualifying Criminal History") shall be disqualified and prohibited from performing any contract duties or services and neither the Contractor nor its Subcontractor may permit such person to provide services at an instructional facility. If a Covered Employee is determined by the Owner's review of the CHRI to have a Disqualifying Criminal History, Contractor will exclude that person from assignment to the Project. Contractor understands that it will not have access to the results of such criminal history records check, based on statewide regulations beyond the control of the Owner, and agrees to rely solely on the judgment of the Owner as to whether the Covered Employee must be excluded from the Project.

§ 3.4.5.3 Prior to commencement of its work on the Project the Contractor will provide written certification to the Owner that either: (1) Contractor and its Subcontractors of every tier, do not have any Covered Employees, as defined; (2) are otherwise exempt from compliance with the Statute; or (3) has complied with the statutory and contractual requirements stated in this Section 3.4.5 as of that date, and that it:

1. has requested a Criminal History Records Check through the District on all Covered Employees, if any, of every tier, has provided the required information to the District to do so and reimbursed the District for same;
2. has obtained written certification from its independent contractors, and Subconsultants (of any tier) that they have provided the required information to the Consultant, necessary to secure the information from the District and reimbursed the Consultant for same; and
3. have excluded any Covered Employee reported by the District to have a Disqualifying Criminal History from assignment to the Project.

Further, Consultant agrees that if it receives information that a Covered Employee is arrested or convicted for any of the Disqualifying Criminal History offenses, during the performance of the Work, Consultant will immediately remove the Covered Employee from District's property or other location where students are regularly present, and notify the District of said removal within three (3) days of doing so. Consultant understands that any failure to comply with the requirements of this section may be grounds for termination of this Agreement, in accordance with Article 14, Termination.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. The Contractor further warrants that Contractor shall perform the Work in a good and workmanlike manner, continuously and diligently in accordance with all applicable codes, generally accepted standards of construction practice for construction of projects similar to the Project. All materials shall be installed in a true and straight alignment, level and plumb; patterns shall be uniform; and jointing of materials shall be flush and level, unless otherwise directed in writing by the Architect. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. No acceptance or payment by the Owner shall constitute a waiver of the foregoing and nothing herein shall exclude or limit any warranties implied by law. The warranties provided in this Section 3.5.1 are in addition to, and not

in limitation of, any other warranties, remedies and/or guaranties set out in the Contract Documents or under applicable law.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.5.3 Contractor acknowledges that the Project may involve construction work on more than one (1) building for the Owner. In such case, each building, or approved phase of each building, may have its own, separate, and independent date of Substantial Completion (or, for Work to be completed or corrected after the date of Substantial Completion, the Warranty Commencement Date). Contractor shall maintain a complete and accurate schedule of the date(s) of Substantial Completion, the date(s) of Final Completion, and the dates upon which the warranties under granted in the Contract Documents will expire, on each phase or building and will provide a copy of such Schedule to the Owner, as required in Subsection 3.5.6, as a condition precedent to Final Payment.

§ 3.5.4 When deemed necessary by the Owner and prior to installation of any item specifically made subject to a performance standard or regulatory agency standard under any provision of the Contract Documents, Contractor shall furnish proof of conformance to the Architect. Proof of conformance shall be in the form of an affidavit from the manufacturer certifying that the item is in conformance with the applicable standards; an affidavit from a testing laboratory certifying that the product has been tested within the past year and is in conformance with the applicable standards; or such further reasonable proof as is required by the Architect.

§ 3.5.5 The Contractor agrees to assign to the Owner at the time of Final Completion of the Work any and all manufacturer's warranties relating to equipment, machinery, materials, equipment or components and labor incorporated into the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third-party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right, but not a duty, of enforcement of such warranty obligations. The warranties provided in this Section 3.5 or otherwise provided in the Contract Documents or by law, shall in no way limit or abridge the warranties provided by the suppliers of equipment and systems which are to comprise a portion of the Work. A complete set of all warranties required from contractors, manufacturers, or suppliers as appropriate, on the manufacturer's or supplier's approved forms, executed by Contractor as required, with a Warranty Commencement Date noted as required, and in the form required by Subparagraph 3.5.6 shall be submitted to the Architect for delivery to the Owner, as a condition precedent to Final Payment.

§ 3.5.6 Prior to receipt of Final Payment, Contractor shall: (1) obtain duplicate original warranties, executed by all subcontractors, and the warranties of suppliers and manufacturers, noting the Warranty Commencement Date on the face of each; (2) verify that the documents are in proper form and contain full information; (3) Co-sign warranties when required; (4) bind all warranties in commercial quality 8-1/2 X 11 inch three-ring binder, with hardback, cleanable, plastic covers; (5) label the cover of each binder with a typed or printed title labeled "WARRANTIES", along with the Title of the Project; name, address and telephone number of Contractor; and name of its responsible principal; (6) include a Table of Contents, with each item identified by the number and title of the specification section under which the product is specified; (7) include the Schedule of Warranty Commencement Dates required by Subparagraph 3.5.3; (8) separate each warranty with index tab sheets keyed to the Table of Contents listing; and (8) deliver warranties in the form described in this Subparagraph 3.5.6, to the Architect for review same prior to submission to the Owner.

§ 3.6 Taxes

The Contractor shall not include in the Contract Price or any Modification any amount for sales, use, or similar taxes for which (1) a Texas independent school district is exempt, and (2) the Owner has provided the Contractor with a tax exemption certificate or other documentation necessary to establish the Owner's exemption from such taxes.

CONTRACTOR HEREBY RELEASES, INDEMNIFIES, AND HOLDS HARMLESS OWNER FROM ANY AND ALL CLAIMS AND DEMANDS MADE AS A RESULT OF THE FAILURE OF CONTRACTOR OR ANY SUBCONTRACTOR TO COMPLY WITH THE PROVISIONS OF ANY OR ALL SUCH LAWS AND REGULATIONS.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time proposals are received or negotiations concluded. The Owner shall be responsible for payment of TDLR Texas Accessibility submissions and inspection costs.

§ 3.7.2 In performing its obligations hereunder, the Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work and upon request by the Owner or Architect shall furnish evidence, satisfactory to the Owner, of such compliance.

§ 3.7.3 If the Contractor performs Work when Contractor knows or reasonably should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, the Contract Documents, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction. **THE CONTRACTOR AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER, ITS TRUSTEES, OFFICERS, REPRESENTATIVES, AGENTS AND EMPLOYEES FROM AND AGAINST ALL THIRD-PARTY CLAIMS, FINES, PENALTIES, OR LIABILITIES FROM, ARISING OUT OF, OR BASED UPON CONTRACTOR'S VIOLATION OF ANY LAWS, ORDINANCES, RULES, REGULATIONS, ORDERS OR DECREES.**

(Paragraphs deleted)

§ 3.7.4 Claims for Concealed or Unknown Conditions

Contractor acknowledges that there may exist at the Project site certain soil and geological conditions and/or surface physical conditions which are not disclosed in the Contract Documents, and which have been known to or may be reasonably anticipated to occur in the area or be related to any past use of the Project site, including, without limitation, the presence of rock and its hardness, geologic formations, differing soils, and surface structures, equipment or other impediments, either natural or man-made (collectively, "Subsurface Conditions"). Owner makes no representations or warranties regarding Subsurface Conditions at the Project site, or of the accuracy or continuity of conditions which may be noted in any reports furnished or made available to Contractor. Contractor covenants and agrees that any such reports are furnished or made available by Owner to Contractor for information purposes only, and Contractor acknowledges that Owner is not responsible for the content thereof. Contractor shall be responsible for inspecting the site and determining the existence or likelihood of any Subsurface Conditions which may affect the Contract Time or the Contract Sum, or both. The Contract Time and the Contract Sum contained herein (as proposed by Contractor), or GMP as applicable, shall be deemed to include all costs of and sufficient time to complete all Work associated with or attributable to Subsurface Conditions, and Contractor shall not be entitled to submit a claim for or to obtain an extension of the Contract Time or increase in the Contract Sum due to the existence of Subsurface Conditions. Except as provided above with respect to Subsurface Conditions, if the Contractor encounters conditions at the site that are subsurface or otherwise concealed physical conditions which were not known to the Contractor, and that differ materially from those indicated in the Contract Documents the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed, and in no event later than three (3) days after first observance of the conditions and report its findings to the Owner and Architect.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Time arising from the existence of such remains or features may be made as provided in Article 15. In accordance with the terms of this Agreement, there will be no adjustment to the Contract Sum for delay arising out or related to the circumstances described in this Section 3.7.5.

§ 3.7.6 The Contractor shall also obtain all permits and approvals, and pay all fees and expenses, if any, associated with National Pollutant Discharge Elimination System (NPDES) regulations administered by the Environmental Protection Agency (EPA) and local authorities, if applicable, that require completion of documentation and/or acquisition of a "Land Disturbing Activities Permit" for the Project. Contractor's obligations under this Section do not require it to perform engineering services during the pre-construction phase to prepare proper drainage for the construction sites.

However, any drainage alterations made by Contractor during the construction process which require the issuance of a permit shall be at Contractor's sole cost.

§ 3.7.7 The Contractor shall certify in writing that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by Local/State standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The Contractor shall provide this written certification as part of submittals under the Section in the Instruments of Service related to Contract Closeout.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner within such time as is reasonably specified by the Contractor as necessary to avoid delay in the Work.

§ 3.8.4 When performing Work under Allowances, where reasonably possible, Contractor shall solicit and receive no fewer than three (3) written proposals and shall provide the Work on the basis of the best value for the Owner, as directed by the Architect following Owner's written approval of the cost proposal.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor shall not replace the Superintendent prior to Final Completion of the Work unless (1) the Superintendent shall cease to be employed by the Contractor or its subsidiaries or affiliated companies, or (2) the Owner agrees to such replacement. The Superintendent may not be employed on any other project prior to Final Completion of the Work. From Substantial Completion to Final Completion, the Superintendent shall be on-site as necessary to ensure that Final Completion occurs within thirty (30) days of Substantial Completion.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish a list to the Architect a list of all engineers, consultants, job-site superintendents, subcontractors and suppliers involved in construction. The Architect shall provide such information to the Owner. The Owner shall have the right, at any time, to require a change in any engineer, consultant, job-site superintendent, subcontractor or supplier if their performance is deemed unsatisfactory in its sole discretion.

§ 3.9.3 The Contractor shall provide an adequate staff for the proper coordination and expedition of the Work. Owner reserves the right to require Contractor to dismiss from the Work any employee or employees that Owner may deem incompetent, careless, insubordinate, or in violation of any provision in these Contract Documents. This provision is applicable to Subcontractors, Sub-subcontractors and their employees.

§ 3.9.4 Owner shall be notified as soon as Contractor becomes aware, but in no event fewer than twenty-four (24) hours before the time of that the Superintendent is required to be present at the site, that the Superintendent will not be present at the site for any reason, except illness. If the reason is due to illness, then Owner shall be notified as soon as the Contractor obtains the information, but in no event later than the beginning of the day that the Superintendent will be absent from the site. In such event of such absence, the Contractor will designate a person as acting superintendent

and Contractor promptly notify the Owner of the identity and contact information for the designated acting superintendent.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work, utilizing critical path method scheduling techniques. The Schedule shall not exceed the time limits set forth in the Contract Documents. The Schedule shall thereafter be updated on a monthly basis and submitted with each Application For Payment. The receipt of an updated schedule with each Application For Payment shall be a condition precedent to the Owner's duty to make any payment pursuant to Article 9.6. The schedule shall not interfere with the operation of Owner's existing facilities and operations without Owner's prior written approval.

§ 3.10.1.1 Each Schedule shall: (1) break the work into a sufficient number of activities to facilitate the efficient use of critical path method scheduling by the Contractor, Owner, and Architect and shall assign each scheduled activity a cost value consistent with the Schedule of Values so as to allow the Owner and Contractor to project cash flow for the Project; (2) include activities representing manufacturing, fabrication, or ordering lead time for materials, equipment or other items for which the Architect is required to review submittals, shop drawings, product data, or samples; (3) with the exception of the initial schedule, shall indicate the activities, or portions thereof, which have been completed; (4) shall reflect the actual time for completion of such activities, and shall reflect any changes to the sequence or planned duration of all activities.

§ 3.10.1.2 If any updated Schedule exceeds the time limits set forth in the Contract Documents for completion of the Work, the Contractor shall include with the updated Schedule, a statement of the reasons for the anticipated delay in completion of the Work and the Contractor's planned course of action for completing the Work within the time limits set forth in the Contract Documents. If the Contractor asserts that the failure of the Owner or the Architect to provide information to the Contractor is the reason for anticipated delay in completion, the Contractor shall also specify what information is required from the Owner or Architect and documentation of the date such information was requested.

§ 3.10.1.3 Neither the Owner or the Contractor shall have exclusive ownership of float time in the schedule, and all float time shall inure to the benefit of the Project. The Contractor agrees to use its best efforts not to sequence the Work or assign activity durations so as to produce a schedule in which more than one-fourth of the remaining activities have no float time.

§ 3.10.1.4 Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. Submission of any schedule under this Contract constitutes a representation by the Contractor that: (1) the schedule represents the sequence in which the Contractor intends to prosecute the remaining Work; (2) the schedule represents the actual sequence and durations used to prosecute the completed Work; (3) that to the best of its knowledge and belief the Contractor is able to complete the remaining Work in the sequence and time indicated; and, (4) that the Contractor intends to complete the remaining Work in the sequence and time indicated.

§ 3.10.1.5 The Contractor shall recommend to the Owner and to the Architect a schedule for procurement of long-lead time items which will constitute part of the Work as required to meet the Project schedule. If such long-lead time items are procured by the Owner, they shall be procured on terms and conditions as recommended by the Contractor. Upon the Owner's acceptance of the Contractor's Stipulated Sum proposal or Guaranteed Maximum Price, as applicable, all contracts previously entered into by Owner shall be assigned by Owner to the Contractor who shall accept responsibility for such contracts as if it had initially entered into such contracts. Contractor shall expedite the delivery of long-lead time items. The Contractor shall receive and protect all Owner supplied material.

§ 3.10.1.6 The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's

construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect and shall attend progress meetings at the Project Site, in such frequency as are acceptable to the Owner. Progress of the work shall be reported at said meetings with reference to Contractor's construction schedule.

§ 3.10.4 The Contractor shall submit to the Architect with each monthly application for payment a copy of the progress schedule showing all modifications required, and shall take whatever corrective action is necessary to assure that the project completion schedule is met at no additional cost to Owner, except as allowed herein.

§ 3.10.4 Correction of Delay.

§ 3.10.4.1 In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, or any Milestone Date unless any such adjustment is submitted by the Contractor as a Claim in compliance with Article 15 or the adjustment is otherwise agreed to in a written confirmation from the Owner and documented by written Change Order.

§ 3.10.4.2 If at any time the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitations, (i) working additional shifts of overtime, (ii) supplying additional manpower, equipment and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule. The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Subparagraph 3.10.4. The Owner may exercise the rights furnished the Owner under or pursuant to this Subparagraph 3.10.4 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

§ 3.10.4.3 In the event Contractor determines that the Scheduled Completion Date cannot be met by resequencing the Work, then Contractor shall immediately provide to the Owner, and in any event within seven (7) days after the date of receipt of any request by Owner for resequencing or acceleration, a plan to complete the Work in the shortest possible time. No approval by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor pursuant to this paragraph shall constitute a waiver by Owner of any damages or losses which Owner may suffer by reason of such resequencing or the failure of Contractor to meet the Scheduled Completion Date.

§ 3.11 Documents and Samples at the Site

The Contractor shall maintain and make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, field test records (including environmental inspection and test records), inspection certificates or records, manufacturers' certificates, The Documents to be maintained shall be kept in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner or their respective representatives, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. Specific dimensions, quantities, installation and performance of equipment and systems in compliance with the Construction Documents and the Contract Documents remain the Contractor's responsibility.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect, in writing, of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Contractor represents and warrants that all shop drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the shop drawings are prepared and, if required by the Architect or applicable law, by a licensed engineer. The Owner and the Architect shall be entitled to rely upon the adequacy, completeness and accuracy of the services, certifications, and approvals performed or provided by such design professionals. Pursuant to

this Section 3.12.10.1, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. A registered architect must prepare plans and specifications for all the Work, as governed by the Texas Occupations Code Chapter 1051; and a registered engineer must prepare plans, specifications and estimates for all Work governed by Texas Occupations Code Chapter 1001. In the event that Contractor retains a licensed design professional under the terms of this paragraph, Contractor shall require that the licensed design professional carry commercial general liability and errors and omissions insurance coverage in the same amounts and forms as required of the Architect on this Project. In the event that the licensed design professional retained by the Contractor will be conducting on-site services or observations, the licensed design professional shall also carry worker's compensation insurance and comprehensive automobile liability in the same amounts and forms as required of the Architect on this Project.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.10.3 The Architect's review of Contractor's submittals will be limited to one examination of an initial submittal and one (1) examination of a resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. The Contractor shall so conduct its operations as not to unreasonably interfere with traffic on public thoroughfares adjacent or near to the Project site.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 Without prior approval of the Owner, the Contractor shall not permit any workers to use any of Owner's existing facilities at or adjacent to the Project site, including, without limitation, lavatories, toilets, entrance and parking areas other than those designated by the Owner. The Contractor shall comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and District's Buildings.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly, provided, however, that any such cutting, fitting or patching can only be performed if the cutting, fitting or patching results in Work that is in accordance with the Contract Documents. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall, on a daily basis, keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. Contractor shall provide on-site containers for the collection of waste materials, debris and rubbish, and shall periodically remove waste materials, debris and rubbish from the Work and dispose of all such materials at legal disposal areas away from the site. All cleaning operations shall be scheduled so as to ensure that contaminants resulting from the cleaning process will not fall on newly-coated

or newly-painted surfaces. Immediately after unpacking materials, all packing case lumber or other packing materials, wrapping or other like flammable waste shall be collected and removed from the building and premises. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. Prior to the Architect's inspection for Substantial Completion, the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, putty, soil, paint and foreign substances from all surfaces, including glass and painted surfaces; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in mechanical equipment; clean roofs, gutters, and downspouts; remove obstructions and flush debris from drainage systems; clean site; sweep paved areas and rake clean other surfaces; remove trash and surplus materials from the site; clean and polish all floors; clean and polish all hardware; and repair all Work damaged during cleaning and replace any damaged or broken glass.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor. Such reimbursement amounts may be deducted from Contractor's Final Payment Application.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Architect and their designated representatives, with access to the Work in preparation and progress wherever located. The presence of the Owner, Architect or their representatives does not constitute acceptance or approval of the Work. Upon request of the Architect or Owner, the Contractor shall accompany the Architect or Owner on an inspection of the Work.

§ 3.17 Royalties, Patents and Copyrights

THE CONTRACTOR SHALL PAY ALL ROYALTIES AND LICENSE FEES. TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER, THE OWNER'S TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES DEFEND AGAINST ANY AND ALL SUITS, CLAIMS, LAWSUITS, JUDGMENTS, COSTS, LIENS, LOSSES, EXPENSES, FEES (INCLUDING REASONABLE ATTORNEY'S FEES, AS PERMITTED BY STATUTE), PROCEEDINGS, ACTIONS, DEMANDS, CAUSES OF ACTION, LIABILITY FOR INFRINGEMENT OF COPYRIGHTS AND PATENT RIGHTS ALLEGED TO HAVE RESULTED FROM CONTRACTOR'S INFRINGEMENT, AND SHALL INDEMNIFY AND HOLD THE OWNER THE OWNER'S TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM LOSS ON ACCOUNT THEREOF, INCLUDING ATTORNEY'S FEES (AS PERMITTED BY STATUTE), BUT SHALL NOT BE RESPONSIBLE FOR DEFENSE OR LOSS WHEN A PARTICULAR DESIGN, PROCESS, OR PRODUCT OF A PARTICULAR MANUFACTURER OR MANUFACTURERS IS REQUIRED BY THE CONTRACT DOCUMENTS, OR WHERE THE COPYRIGHT VIOLATIONS ARE CONTAINED IN DRAWINGS, SPECIFICATIONS, OR OTHER DOCUMENTS PROVIDED BY THE OWNER OR PREPARED BY THE ARCHITECT. HOWEVER, IF AN INFRINGEMENT OF A COPYRIGHT OR PATENT ATTRIBUTABLE TO THE OWNER OR ARCHITECT, IS DISCOVERED BY, OR MADE KNOWN TO, THE CONTRACTOR, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOSS UNLESS THE INFORMATION IS PROMPTLY FURNISHED TO THE OWNER AND THE ARCHITECT.

§ 3.18 Indemnification

§ 3.18.1 TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL INDEMNIFY, DEFEND (EXCEPT AS LIMITED BELOW) AND HOLD HARMLESS THE OWNER, THE OWNER'S TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES (HEREINAFTER IN THIS SECTION 3.18 "OWNER"), FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, (INCLUDING BUT NOT LIMITED TO REASONABLE ATTORNEY'S FEES, AS PERMITTED BY STATUTE), ARISING OUT OF OR RESULTING FROM PERFORMANCE OF THE WORK, PROVIDED THAT SUCH CLAIM, DAMAGE, LOSS, OR EXPENSE IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY (OTHER THAN THE WORK ITSELF), INCLUDING THE LOSS OF USE RESULTING THEREFROM, CAUSED IN WHOLE OR IN PART BY THE WILLFUL, INTENTIONAL OR NEGLIGENT ACTS OR OMISSIONS OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THE CONTRACTOR, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS, OR EXPENSE IS CAUSED IN PART BY THE OWNER. IF THE OWNER'S NEGLIGENCE IS A CONCURRENT CAUSE OF THE INJURY, DEATH, OR DAMAGE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT

(JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER AND CONTRACTOR ARE BOTH PARTIES. SUCH OBLIGATION SHALL NOT BE CONSTRUED TO NEGATE, ABRIDGE, OR REDUCE OTHER RIGHTS OR OBLIGATIONS OF INDEMNITY THAT WOULD OTHERWISE EXIST AS TO A PARTY OR PERSON DESCRIBED IN THIS SECTION 3.18.

§ 3.18.2 IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER SECTION 3.18.1 SHALL NOT BE LIMITED BY A LIMITATION ON AMOUNT OR TYPE OF DAMAGES, COMPENSATION, OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS, OR OTHER EMPLOYEE BENEFIT ACTS.

§ 3.18.4 THE DUTY TO DEFEND SET OUT ABOVE SHALL NOT APPLY IN THE EVENT THAT THE CLAIM IS BASED, IN WHOLE OR IN PART, ON THE NEGLIGENCE OF, FAULT OF, OR BREACH OF CONTRACT BY THE OWNER. NOTWITHSTANDING THE FOREGOING, THE CONTRACTOR AGREES TO REIMBURSE THE OWNER'S REASONABLE ATTORNEY'S FEES IN PROPORTION TO THE CONTRACTOR'S LIABILITY.

§ 3.18.5 CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL HOLD OWNER FREE AND HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO CONTRACTOR'S OR ITS SUBCONTRACTORS' CONSTRUCTION TOOLS AND EQUIPMENT AND RENTED ITEMS WHICH ARE USED OR INTENDED FOR USE IN PERFORMING THE WORK, REGARDLESS OF WHETHER SUCH LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY THE WILLFUL, INTENTIONAL OR NEGLIGENT ACTS OR OMISSIONS OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THE CONTRACTOR, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS, OR EXPENSE IS CAUSED IN PART BY THE OWNER. IF THE OWNER'S NEGLIGENCE IS A CONCURRENT CAUSE OF THE INJURY, DEATH, OR DAMAGE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER AND CONTRACTOR ARE BOTH PARTIES. THIS PROVISION SHALL APPLY, WITHOUT LIMITATION, TO LOSS OR DAMAGE OCCURRING AT THE WORK SITE OR WHILE SUCH ITEMS ARE IN TRANSIT TO OR FROM THE WORK SITE AND IS IN ADDITION TO CONTRACTOR'S OBLIGATIONS UNDER SECTION 3.18.1.

§ 3.18.6 The indemnification hereunder shall include, without limiting the generality of the foregoing, liability which could arise to the Owner pursuant to State statutes for the safety of workmen and in addition, all Federal statutes and rules existing thereunder for protection, occupational safety and health to workmen. It being agreed that the primary obligation of the Contractor is to comply with said statutes in performance of the Work by Contractor and that the obligations of the Owner under said statutes are secondary to that of the Contractor.

§ 3.18.7 It is agreed with respect to any legal limitations now or hereafter in effect and affecting the validity or enforceability of the indemnification obligations under Section 3.18, such legal limitations are made a part of the indemnification obligation and shall operate to amend the indemnification obligation to the minimum extent necessary to bring the provision into conformity with the requirements of such limitations, and as so modified, the indemnification obligations shall continue in full force and effect.

§ 3.18.8 Contractor shall promptly advise the Owner, in writing, of any claim or demand against the Owner or Contractor, known to the Contractor related to or arising out of Contractor's activities under this Contract.

§ 3.18.9 The provisions in Section 3.18 in its entirety shall survive the completion, termination or expiration of this contract and are solely for the benefit of the parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

§ 3.19 Representations And Warranties

§ 3.19.1 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute this Contract, which representations and warranties shall survive the execution and delivery of the Contract and the Final Completion of the Work:

- .1 that it is financially solvent, able to pay its debts as they mature and possessed of sufficient working capital to complete the Work and perform its obligations under the Contract Documents;
- .2 that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;
- .3 that it is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental and public quasi-public authorities having jurisdiction over it and over the Work and the site of the Project;
- .4 that the execution of the Contract and its performance thereof is within its duly authorized powers; and
- .5 that its duly authorized representative has visited the site of the Work, familiarized itself with the local conditions under which the Work is to be performed and correlated its observations with the requirements of the Contract Documents.

§ 3.20 Business Standards

§ 3.20.1 Contractor, in performing its obligations under Contract, shall establish and maintain appropriate business standards, procedures, and controls, including those necessary to avoid any real or apparent impropriety or adverse impact on the interest of Owner or affiliates. Contractor shall review, with Owner, at a reasonable frequency during the performance of the Work hereunder, such business standards and procedures including, without limitation, those related to the activities of Contractor's employees and agents in their relations with Owner's employees, agents, and representatives, vendors, Subcontractors, and other third parties, and those relating to the placement and administration of purchase orders and contracts.

§ 3.21 Antitrust Violation

To permit the Owner to recover damages suffered in antitrust violations, Contractor hereby assigns to Owner any and all claims for overcharges associated with this Contract which violate the antitrust laws of the United States, 15 U.S.C.A. Section 1 et seq. The Contractor shall include this provision in its agreements with each subcontractor and supplier. Each subcontractor shall include such provisions in agreements with sub-subcontractors and suppliers.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner,

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date of the Owner's contract with the Architect terminates. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, or as they may be amended in the future.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents, and delivered on time. In addition, the Architect or its structural consultant will (1) provide on-site observations prior to and during all concrete pours that contribute to the structural integrity of the building, including all pours of concrete piers, footings, grade beams, floor slabs, and concrete superstructure components, if applicable; and (2) provide on-site observations prior to covering up or closing up of portions of the construction which, if covered, would conceal problems with the structural integrity of the Project. Contractor shall not close or cover said Work until said observations have occurred. Contractor or Architect will advise Owner of the need for any third-party laboratory or testing services to assist the Architect and Owner.

§ 4.2.3 On the basis of the site observations, the Architect will keep the Owner informed about the progress and quality

of the Work. The Architect shall promptly report to the Owner and Contractor orally regarding: (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. An oral notification of defects and deficiencies observed in the Work shall be followed by a notice in writing to the Owner and Contractor specifying the defect(s), non-conforming Work, deviations from the Contract Documents and corrective actions taken or recommended. The Architect shall not have control over or responsibility for the Contractor's construction means, methods, techniques, sequences, procedures, or safety programs and will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents, nor shall the Architect have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work. This does not, however, relieve Architect of Architect's responsibilities under this Agreement. Any services by Contractor made necessary by Contractor's construction defect or nonconforming Work shall be performed by the Contractor at no additional cost to Owner. In addition, the Contractor shall reimburse the Owner for compensation paid to the Architect (whether performed by the Architect or its Consultants) or the Owner's Consultants, for additional site visits made necessary by the fault, neglect, the request of the Contractor or made necessary by the Contractor's construction defect or nonconforming Work. Any amount subject to reimbursement under this Section may be required by Owner to be deducted from the next Payment Application submitted by the Contractor and any subsequent Payment Application until paid, and if any amount remains unpaid, the balance shall be paid by the Contractor as a condition to Final Payment.

§ 4.2.4 Communications

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters relating to the Contract and the Project. However, the Owner reserves the right to communicate directly with the Contractor and Subcontractors. Communication by and with the Architect's consultants shall be through the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, in accordance with the Contract Documents, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect or the Owner has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect or the Owner considers it necessary or advisable, the Architect or the Owner will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect or the Owner nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Owner to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work. Certain portions of the Work may be tested and/or observed at various stages, sometimes off the Project site, between initial observation or review and final positioning of the completed Work. Nothing in any initial or prior approval or test result shall prevent action to require conformance, if at any subsequent time the Work or any portion thereof is found not to conform to the requirements of the Contract Documents. Architect and/or Contractor shall promptly notify, the other party orally and in writing, and Owner of any perceived fault or defect in the design or nonconformance of the Work with the Construction Documents they may respectively discover and each, upon discovery of the defect or nonconformance, shall be responsible for notifying the other party and Owner of those corrective actions they respectively take; provided, however, Contractor shall have no duty to notify Owner of discoveries made or actions taken by Architect.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or Separate Contractors, and allow sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents.

The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. If any submittal does not comply with the requirements of the Contract Documents, the Architect shall require Contractor to come into compliance. The Architect shall promptly report in writing to the Contractor and Owner any errors, inconsistencies and omissions discovered by the Architect in the Shop Drawings, Product Data and Samples, so as to keep from delaying the Work or the activities of the Owner, Contractor or other Contractors.

§ 4.2.8 The Architect will prepare, and make written recommendations to Owner regarding all Change Orders (including changes in the Work to be paid from contingency funds) and Construction Change Directives, for the Owner's approval and execution in accordance with the Contract Documents. The Architect's recommendation shall be accompanied by all supporting documentation necessary for the Owner to make an informed decision, including but not limited to an itemized turn-key proposal from the Contractor which includes quantities and unit costs of labor and materials extended and totaled and, if permitted, overhead and profit proposed. Prior to submission of such documentation to the Owner, the Architect shall review such proposals for reasonableness of pricing and compliance with Section 7.1.4 regarding markup. The Architect may order minor changes in the Work not involving an adjustment in Contract Sum or Guaranteed Maximum Price, or an extension of the Contract Time which are consistent with the intent of the Contract Documents. If necessary, the Architect shall prepare, reproduce and distribute Drawings and Specifications to describe Work to be added, deleted or modified, as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4. The Architect is specifically **not** authorized to approve changes involving major systems such as: Heating, Ventilation and Air Conditioning ("HVAC"); roof; foundation; outward appearance; color schemes; floor plans; building materials; drainage or mechanical equipment without Owner's prior written consent.

§ 4.2.9 The Architect and the Owner's representative will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion. Upon completion of such inspection and agreement by Owner and Architect as to Substantial Completion, the Architect may issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10 for approval by the Owner.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 Upon written request of the Owner or Contractor, the Architect will issue its interpretation of the requirements of the plans and specifications. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents and not expressly overruled in writing by the Owner.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information at no additional expense to the Owner.

§ 4.2.15 The Architect may appoint an employee or other person to assist the Architect during the construction. These representatives will be instructed to assist the Contractor in interpreting the Contract Documents; however, such assistance shall not relieve the Contractor from any responsibility as set forth by the Contract Documents. The fact that the Architect's Representative may have allowed Work not in accordance with the Contract Documents shall not prevent the Architect from insisting that the faulty Work be corrected to conform to the Contract Documents and the Contractor shall correct same.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, in writing, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect shall notify the Contractor in writing, whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection. A notice of no reasonable objection shall in no way relieve the Contractor from full responsibility for performance and completion of the Work and its obligations under the Contract Documents. The Contractor shall be fully responsible for the performance of its subcontractors, including those recommended or approved by the Owner.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. When the parties agree on a proposed substitute Subcontractor reasonably capable of performing the Work, the Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected without providing reasonable written notice to the Owner and Architect. If neither the Owner nor Architect submits a reasonable objection to such proposed substitution within ten (10) days following their receipt of written notice the Contractor may proceed with the substitution. If either Owner or Architect submit an objection, the Subcontractor shall proceed in accordance with Section 5.2.3 above.

§ 5.2.5 Each Contractor or subcontractor shall be required to completely familiarize itself with the plans and specifications, to visit the Work site to completely familiarize itself with existing conditions, and to conduct any other appropriate investigations, inspections or inquiries prior to submission of a bid or proposal. No increases in Contract Sum shall be allowed for failure to so inspect or investigate.

§ 5.3 Subcontractual Relations

§ 5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. The terms and conditions of the Contract Documents shall be incorporated by reference into each subcontract agreement, included as provided below. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each

proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. Each subcontractor shall provide proof of insurance to Contractor consistent with the Contractor's insurance to Owner and in an amount commensurate with the Work to be performed by the Subcontractor.

§ 5.3.2 Neither the Owner nor the Architect shall be obligated to pay or to insure the payment of any monies to Subcontractors or vendors by the Contractor.

§ 5.3.3 The Contractor shall require any potential Subcontractor to disclose to the Contractor any ownership interest or familial relationship between the Contractor, the Architect or the Owner and the potential Subcontractor prior to entering into a contract. Contractor shall report to Owner all such disclosures and the Owner shall have the right, in its sole discretion, to reject any such affiliated Subcontractor.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for any unperformed portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner or abandonment of the Project by the Contractor and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing;
- .2 assignment is subject to the prior rights and obligations of the surety, if any, obligated under bond relating to the Contract; and
- .3 The Subcontractor provides bonds as required by law of prime contractors and by Owner.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation may, in the Owner's sole discretion, be equitably adjusted for increases in cost resulting from the suspension. Such assignment shall not constitute a waiver by Owner of its rights against Contractor, including, but not limited to, claims for defaults, delays or defects for which a subcontractor or material vendor may also be liable.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. Owner shall only be responsible for compensating subcontractors for Work performed or materials furnished from and after the date on which the Owner gives written notice of its acceptance of the subcontract agreement. Owner shall not be responsible for any Work performed or materials furnished by subcontractors prior to the date of Owner's written notice of acceptance.

§ 5.5 Notice Of Subcontractor Default

Contractor shall promptly notify Owner and Architect of any material defaults by any Subcontractor or Sub-subcontractor. Notwithstanding any provision contained in Article 5 to the contrary, it is hereby acknowledged and agreed that Owner has in no way agreed, expressly or implicitly, nor will Owner agree, to allow any Subcontractor, Sub-subcontractor or other materialman or worker employed by Contractor the right to obtain a personal judgment or to create a mechanic's or materialman's lien against Owner for the amount due from the Owner or the Contractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement by the Owner and Contractor. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 [Paragraph Deleted.]

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for site access, staging, introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work.

§ 6.2.3 All costs resulting from the Contractor's negligence, lack of oversight, inattention to detail, failure to investigate, or failure to follow the Construction Documents or Contract Documents, will be borne by the Contractor. The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor, the Architect or any Consultant because of the Contractor's delays, improperly timed activities or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Owner will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Changes may be funded out of a contingency fund, if any, or other allowance established herein, or may require a change in the Contract Sum. The authority to approve a change to the Work, the Contract Sum, approve payment from a Contingency or Allowance, or a change in the Project Time, rests solely with the Owner. A Change Order funded from the Contingency or other Allowance shall be referred to herein for clarity as a "Contingency Authorization Order".

§ 7.1.2 A Contingency Authorization Order or Change Order shall be based upon agreement among the Owner, Contractor, and Architect executed prior to commencement of any Work covered by the Order. A Construction Change Directive (whether funded from contingency, if any, or by an increase in the Contract Sum) requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor prior to the commencement

of the Work. An order for a minor change in the Work may be issued by the Architect alone, except as otherwise provided herein.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 Change Order Mark-Up. On Change Orders and Construction Change Directives, the total Contractor mark-up for overhead, profit permitted to be charged to the Owner shall be based on the following schedule:

- .1 for work performed by the Contractor's own forces, Contractor's mark-up for overhead and profit shall not exceed 10% of the cost of the change in the Work (0% for change orders to be paid out of any contingency allowance).
- .2 for the Contractor, for supervision of work performed by the Contractor's Subcontractors, the total Contractor mark-up for overhead and profit shall not exceed 4% of the amount due to the Subcontractors (0% for change orders to be paid out of any contingency allowance).
- .3 for each Subcontractor or Sub-subcontractor involved, in Work performed by that Subcontractor's or Sub-subcontractor's own forces, the total mark-up for overhead and profit ten percent (10%) of the cost of the change in the Work.
- .4 In no event shall total mark-up for overhead, profit or fee in any work which involves a subcontractor or one or more sub-subcontractors, regardless of who performs the work, exceed 14% of the total cost of the change in the Work. The Contractor will not be allowed an overhead, profit, or fee mark-up when changes in the Work are funded by Contingency or other Allowances provided for in the Contract Documents.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

Methods used to determine adjustments to the Contract Sum or Guaranteed Maximum Price may include those listed in Section 7.3.3.

§ 7.2.2 Acceptance of a disbursement from any allowance fund, contingency fund or acceptance of a Change Order by the Contractor shall constitute full accord and satisfaction for any and all claims, whether direct or indirect, including but not limited to impact, delay or acceleration damages, arising from the subject matter of the disbursement or Change Order.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum (the Guaranteed Maximum Price, as applicable) or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum (the Guaranteed Maximum Price, as applicable) and Contract Time being adjusted as provided in Section 7.3.3.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum (or the Guaranteed Maximum Price, as applicable), the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon (additional mark-ups for overhead and profit will not be allowed);

- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee, subject to the limitations of subparagraph 7.1.4; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum (or the Guaranteed Maximum Price, as applicable), the Architect shall determine the adjustment on the basis of the amount by which the Contractor's direct costs have actually been increased over the direct cost of performing the Work without the Change in the Work. Direct costs shall be limited to the following:

- .1 Actual documented costs of labor, including applicable payroll taxes and other employee costs approved by the Owner prior to the approval of the Change Order or Contingency Authorization Order (a labor burden factor will not be accepted as documentation);
- .2 Actual documented costs of materials, supplies, and equipment, including cost of transportation, whether such materials, supplies, and equipment are incorporated or consumed;
- .3 Actual documented rental costs of machinery and equipment, if rented from unaffiliated third-parties, exclusive of hand tools;
- .4 Actual documented costs of premiums for all bonds and insurance, permit fees, and applicable sales, use, or similar taxes, directly related to the change, if any; and
- .5 Actual documented costs of supervision and field office personnel directly attributable to the change and only if the adjustment causes an extension of the Contract Time.

The Contractor shall keep and present, in such form as the Architect or Owner may prescribe, an itemized accounting of the items listed above, together with appropriate supporting documentation.

§ 7.3.5 If the Work is performed without an agreement as to the final price, the Contractor shall, at a minimum, retain and provide to the Owner, the following documentation to adequately document its actual costs of performing the scope of work set out in a Construction Change Directive. Adequate Documentation shall include at a minimum, but not limited to, payroll records for employees of Contractor providing the Work included in the Change Directive, as well as written documentation of time spent **solely** on the scope of the Change Directive Work, prepared concurrent with the performance of the Work, including (for example) sign-in and sign-out sheets or time cards, executed by the employee(s) documenting attendance and receipts for all materials delivered to the Project site for incorporation in the Work of the Change Directive and paid for by the Contractor. If any of the Work of the Change Directive is performed by subcontractors, the Contractor shall provide a copy of the subcontract, an itemized invoice or payment application which includes, in either case, a detailed itemization of costs showing quantities and unit costs of labor and materials extended and totaled and, if permitted, overhead and profit (in accordance with Section 7.1.4) labor and materials provided by the subcontractor, with receipted invoices for all materials incorporated in the Work and evidence of payment by the subcontractor attached. If the Contractor disagrees with the adjustment in the Contract Time, the Contract Sum (or the Guaranteed Maximum Price, as applicable), allowed in any Change Directive, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement (by executing and returning the Change Directive) or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time, not later than ten (10) calendar days following the Contractor's receipt of the Construction Change Directive. A copy of a notice of disagreement shall also be provided to the Owner concurrent with the notice to the Architect. A Notice of Disagreement must contain the number of the Change Directive, the date the Change Directive was issued and the words "**Notice of Disagreement With Change Directive**" in the Subject line. It is imperative that Owner receive timely specific notice of any potential problem identified by Contractor in order that the problem can be mitigated or resolved promptly.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and/or the Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost plus the permitted overhead and profit as set forth in Section 7.1.4. When both additions and credits covering related Work or substitutions are involved in a change, both changes shall be shown on the same Change Order and the permitted allowance for overhead and profit shall be figured on the

basis of net increase, if any, with respect to that change. Returned materials shall be credited at actual cost and no penalty or restocking fee shall be permitted to be charged to the Owner.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will require as a condition precedent to certification of payment for Work completed under the Construction Change Directive that the Contractor provide the documentation required by Section 7.3.4, and based on such documentation, shall make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect is specifically authorized by this Section 7.3.9 to require submission of such documentation and any other documentation required to evaluate the requested payment, and shall withhold payment certification until such documentation is received and an interim determination is made in accordance with this Section. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order reflecting the Agreement of the Owner and Contractor. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

With prior written notice to the Owner's representative, the Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time. The Contractor shall carry out such written orders promptly. Minor changes in the Work shall not include changes that involve the outward appearance of the structure, color schemes, floor plans, building materials, landscaping, or mechanical equipment.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Contract Time. Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 Commencement. The date of commencement of the Work shall be the first business day following the Contractor's written notice to proceed. The notice to proceed shall not be issued until the Agreement (or Guaranteed Maximum Price Amendment, as applicable) has been signed by the Contractor and the Owner, and the Owner and Architect have received and approved as to form all required payment and performance bonds and insurance as required by Article 11.

§ 8.1.3 Substantial and Final Completion

§ 8.1.3.1 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.3.2 The date of Final Completion is the date certified by the Architect in accordance with Section 9.10. Unless otherwise agreed in writing by Owner, Contractor agrees that Final Completion shall occur not more than thirty (30) days after the date of Substantial Completion.

§ 8.1.4 Day. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor stipulates that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.2.4 Liquidated Damages

§ 8.2.4.1 If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the per diem amounts set out in the AIA Document A101 (2017) into which these General Conditions are incorporated and executed concurrently with these General Conditions, commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work.

§ 8.2.4.2 In the event Substantial Completion is not achieved by the designated date, or as it may be extended, Owner may withhold payment of any further sums due until Substantial Completion is achieved. Owner shall also be entitled to deduct out of any sums due to Contractor all liquidated damages, if any, due Owner in accordance with the Contract Documents.

§ 8.2.4.3 In addition to Liquidated Damages, if any, the Contractor shall reimburse the Owner for any Supplemental or Additional Services of the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor or caused by Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.2.4.4 If one or more of the Liquidated Damages provisions set out in the Agreement are held to be legally unenforceable as a penalty (except when the holding is the result of a challenge by the Owner), the Owner shall be allowed to recover actual damages caused by the Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by war, civil commotion, pandemic, epidemic, federal, state or local declared disaster or public emergency, act of God, governmental restrictions, regulations, orders, or interference, fire or other unavoidable casualty, material changes ordered in the Work; adverse weather conditions documented in accordance with Section 15.1.6 by delay authorized in writing by the Owner prior to the happening of the delay event; or by other causes that the Contractor asserts, and the Architect and Owner determine, justify delay, then the Contract Time may be extended for such reasonable time as the Architect and Owner may determine based upon documentation by the Contractor.

§ 8.3.1.1 The adjustment of the Contract Time for delay, disruption, and interference described in this Section 8.3.1 is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time and Contractor's timely delivery of the notice and claim as set out in this Section 8.3.1. An adjustment to the Contract Time shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this Section 8.3.1, and under no circumstances shall the Owner be liable to pay the Contractor any compensation for Owner-caused delays.

§ 8.3.1.2 **Notice and Claim for Extension.** In the event of a delay in the commencement or progress of the Work as a result of any of the circumstances in this Section 8.3.1, the Contractor may receive an extension of time for completion of the Work equal to the delay, if the Contractor delivers a written notice and claim to the Owner and Architect delivered in any manner provided in Section 1.6.1 of this Agreement. The Notice shall identify and provide a reasonably detailed description of the circumstances causing the delay, disruption, or interference to the Contractor's performance or progress of the Work on or before the due date of Contractor's Application for Payment covering the period in which the delay began. Claims for an extension of time shall be stated in whole or half calendar days, as applicable. The actual date on which the delay(s) began and/or the date the delay ended, if applicable, must be stated in the Claim Notices as applicable.

§ 8.3.2 In the case of claims for extension of time because of unusually inclement weather, such extension of time may be granted only if the Contractor files a claim in accordance with the requirements set out in Section 15.1.6.

§ 8.3.3 Contractor shall not be entitled to an adjustment in the Contract Time for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

§ 8.3.4 Any adjustment of the Contract Time authorized under Section 8.3 shall be conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time and Contractor's submission of a timely and properly documented Notice and Claim for additional time in accordance with Section 8.3.

§ 8.3.5 Adjustments to the Contract Time addressed in this Section 8.3 shall apply only to requests for extensions of time based upon delay, disruption, or interference to the Contractor's performance or progress of the Work and shall have no applicability to requests for adjustment of the Contract Time due to other changes in circumstance, including but not limited to: a change in the materials used; a change in the specified manner of constructing and/or installing the Work; or additional labor, services or materials required, beyond those specified by the Contract Documents. Claims for an adjustment of the Contract Time resulting from these kinds of changes shall be authorized only pursuant to a written order or directive from Owner authorizing Contractor to proceed with a change in the Work in accordance with the Contract Documents.

§ 8.4 No Damages or Other Compensation for Delay or Acceleration

This Agreement does not permit recovery by the Contractor of damages or additional compensation for delay, acceleration, disruption, or interference to the Contractor's performance or progress of the Work Contractor agrees that Contractor shall be fully compensated for all delays solely by an extension of time including but not limited to delay, disruption, or interference caused by the Owner the Architect, of an employee of either, or of a Separate Contractor, any of the circumstances set out in Section 8.3.1 or acceleration of the Work required by the Owner in accordance with the terms of this Agreement. Contractor's sole remedy for delay disruption, or interference in its performance or progress of the Work or any required acceleration of the Work shall be the grant of an extension of time for completion equal to a delay or such reasonable time as the Owner and Architect may determine in their sole discretion.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement or the Guaranteed Maximum Price Amendment in the case of a Construction Manager at Risk Contract and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. All costs of overtime Work required by the Contract Time and the nature of the Work, as set forth in or inferable from the Contract Documents, except costs of emergencies covered in Section 10.4, shall be and are included in the Contract. The Contract Sum shall not be increased because the Contractor experiences an unexpected or unforeseeable increase in the price of labor or materials required to complete the Project.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices may be equitably adjusted by written agreement between the Owner and Contractor, executed prior to an order being placed based on the unit prices.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, as applicable, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment or, in the case of a Guaranteed Maximum Price, concurrent with the Guaranteed Maximum Price Proposal, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, or the Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The schedule of values shall be prepared in such a manner that each major item of work,

whether done by Contractor's own forces or subcontracted, is shown as a single line item on AIA Documents G702-1992 and G703-1992, Application and Certificate for Payment and Continuation Sheet.

§ 9.3 Applications for Payment

§ 9.3.1 In accordance with the requirements of Section 5.1 of the Agreement, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage withheld. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703-1992, Continuation Sheet.

§ 9.3.1.1 Such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor has not been invoiced by a Subcontractor or supplier, unless such Work was self-performed; in such case, only portions of Work actually performed shall be included on the Contractor's request for payment.

§ 9.3.1.3 Contractor agrees that, for purposes of Texas Government Code section 2251.042, receipt of the Application for Payment by the Architect shall not be construed as receipt of an invoice by the Owner. Contractor further agrees that Owner's receipt of the Architect's Certificate for Payment shall be construed as a receipt of an invoice by the Owner, for purposes of Texas Government Code section 2251.042.

§ 9.3.1.4 The Owner shall withhold retainage as provided in the Agreement, except that Owner shall not pay amounts for which the Architect refuses to certify payment, or the Owner refuses to pay, as provided herein. The retainage shall be paid to the Contractor with the Final Payment, subject to the requirements of the Contract Documents.

§ 9.3.2 Unless otherwise provided in a separate written agreement executed between the Owner and Contractor prior to delivery, payments shall not be made on account of materials and equipment delivered and stored at the site or off-site for subsequent incorporation in the Work. The Owner may, in Owner's sole discretion, require Contractor's compliance with such reasonable procedures and requirements as it may establish, as a condition precedent to the grant of Owner's consent and agreement to payment, including but not limited to the following:

- .1 provision of any additional insurance required to protect the materials and equipment while stored;
- .2 payment of the costs to store the materials and equipment and any additional transportation costs for multiple deliveries;
- .3 provision of written consent of Contractor's surety to such storage;
- .4 submission of an affidavit identifying materials and equipment stored off-site for later incorporation into the Work, and acknowledging responsibility for such materials and equipment;
- .5 provision of documentation that the facility where the materials and/or equipment will be stored is an adequately insured commercial warehouse, where the materials and equipment stored will be sheltered from the weather and outside elements and are stored in accordance with the manufacturer's instructions, including proper temperature and humidity controls and that the materials and equipment have been physically separated and marked for the Project;
- .6 its agreement to bear the cost of Owner and/or Architect's visits to the off-site storage facility to confirm compliance with these requirements and review the stored contents, and Contractor shall agree to allow such costs to be offset from Progress Payments;
- .7 agreement that payment of any costs related to compliance with the procedures and requirements for storage of materials and equipment on or off-site, shall not be subject to charges for overhead or profit;
- .8 submission of bills of sale or other documentation acceptable to the Owner, showing proof of delivery and establishing the Owner's title to the materials or equipment and/or otherwise protecting the Owner's interest, including naming the Owner as additional insured on the required insurance policy (naming the specific materials or equipment stored and their location) and providing proof of delivery for those materials and equipment;

- .9 agreeing that, in the event of termination of the Contract or default by the Contractor, the material and equipment stored on or off-site shall be immediately turned over to the Owner by delivery to the location designated by the Owner and that the operator of the storage facility is aware of this agreement and willing to honor it; and
- .10 agreeing that all such stored materials and equipment, to the extent they include mechanical components, will be maintained by the Contractor kept in good working condition and ready for immediate installation, to the same extent they would have been, had they been delivered "just in time" for installation, that Contractor will be solely responsible for assuring any manufacturer's warranty will commence on date of completion of installation and/or start-up of the material or equipment and for repairs required prior to installation to assure performance in accordance with the Contract Documents.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. **CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER HARMLESS FROM ANY LIENS, CLAIMS, SECURITY INTERESTS OR ENCUMBRANCES FILED BY A SUPPLIER, SUBCONTRACTORS, OR ANYONE CLAIMING BY, THROUGH OR UNDER THE CONTRACTOR OR SUBCONTRACTOR FOR ITEMS COVERED BY PAYMENTS PREVIOUSLY MADE BY THE OWNER TO CONTRACTOR FOR ITEMS COVERED BY PAYMENTS MADE BY THE OWNER TO CONTRACTOR.**

§ 9.3.4 In each Application for Payment, Contractor shall certify that: the information contained in the Application presented is true, correct, accurate and complete; that the submitted Work has been completed to the extent represented in the Applications for Payment; that the materials and supplies identified in the Applications for Payment have been purchased, paid for, and, unless an agreement described in Paragraph 9.3.2 has been signed, incorporated into the Work; that the subcontractors whose work is identified in the Applications for Payment have been paid, or Contractor has been invoiced for same and intends to pay such subcontractors; there are no known mechanics' or materialmen's liens outstanding at the date of the Application, that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current Application and that except for such bills not paid but so included, there is no known basis for the filing of any mechanics' or materialmen's liens on the Work, and that releases from all contractors and materialmen have been obtained in such form as to constitute an effective release of lien under the laws of the State of Texas covering all Work theretofore performed and for which payment has been made by Owner to Contractor.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, carefully evaluate and review the Application for Payment and, when appropriate, return the Application for Payment to the Contractor as provided in Section 9.4.2. If the Application for Payment is complete, then the Architect shall sign and, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing, of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner in writing, of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. Architect's written reasons for withholding certification shall be construed as the notice required by Texas Government Code Section 2251.042 *et seq.*

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, that the Architect has observed the progress of the Work and determined that, in the Architect's professional opinion based on the Architect's evaluation of the Work and the data in the Application for Payment, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect in writing to the Owner. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data unless requested by the

Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum. Examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's accountants or other representatives of the Owner acting in the sole interest of the Owner.

§ 9.4.3 The issuance of a Certificate for Payment shall constitute a recommendation to the Owner regarding the amount to be paid. This recommendation is not binding on the Owner if Owner knows of other reasons under the Contract Documents why payment should be withheld.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 repeated failure to carry out the Work in accordance with the Contract Documents;
- .8 delay beyond the times set forth elsewhere in the Contract Documents including but not limited to the submission for approval of the schedule of values, cost breakdowns on proposal requests, progress schedule, list of Subcontractors and insurance requirements;
- .9 failure to submit a written plan indicating action by the Contractor to regain the time schedule for completion of Work within the Contract Time;
- .10 evidence of financial inability to perform the Contract fully;
- .11 failure to submit record documents required by the Contract; or
- .12 failure of the Contractor to perform any other obligations of the Contract.

§ 9.5.2 If the Contractor disputes the Architect's or the Owner's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, the Contractor may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld. The Owner shall not be deemed in default by reason of withholding payment as provided for in Section 9.5.1.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment. Notwithstanding any provision contained within this Article, if the Contractor has not achieved Substantial Completion by the required date, subject to extensions of time allowed under the Contract Documents, then Architect may withhold any further Certificate for Payment to the extent necessary to preserve sufficient funds to complete construction of the Project and to cover liquidated damages. The Owner shall not be deemed in default by reason of withholding payment as provided for in Section 9.5.1, or this Section 9.5.4.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued and the Owner has approved a Certificate for Payment, the Owner shall make payment of disputed amounts in the manner and within the time provided in the Contract Documents, and in accordance with the Texas Government Code section 2251.042 *et. seq.*, Owner shall within twenty-one (21) days notify the Architect and Contractor if Owner disputes the Architect's Certificate for Payment, listing the specific reasons for nonpayment. Payments to the Contractor shall not be construed as releasing the Contractor or his Surety from any obligations under the Contract Documents.

§ 9.6.2 In compliance with Texas Government Code Section 2251.022, the Contractor shall, within ten (10) days following receipt of payment from the Owner, pay all bills for labor and materials performed and furnished by others in connection with the construction, furnished and equipping of the improvements and the performance of the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor's failure to make payments within such time shall constitute a material breach of this contract. Contractor shall include a provision in each of its contracts imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors or for materials or labor used in the Work for which the Owner has made payment to the Contractor, the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 The Contractor shall, as a condition precedent to any obligation of the Owner under the Contract Documents, provide to the Owner payment and performance bonds in the full penal amount of the Contract in accordance with Texas Government Code Chapter 2253. Notwithstanding the foregoing, payments received by the Contractor from the Owner for Work properly performed by Subcontractors, or materials properly provided by suppliers, shall be held in trust by the Contractor for the benefit of those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

Pursuant to Texas Government Code Section 2251.051, if the Owner does not pay the Contractor any payment certified by the Architect, which is undisputed, due and owing after the date the payment is due under the Contract Documents, then the Contractor may, upon ten (10) days' written notice to the Owner and Architect, that payment has not been made and the Contractor intends to suspend performance for nonpayment, may stop the Work until payment of the undisputed amount owing has been received. If the Owner provides written notice to the Contractor that: 1) payment has been made; or 2) a bona fide dispute for payment exists, listing the specific reasons for nonpayment, then Contractor shall be liable for damages resulting from suspension of the Work. If a reason specified is that labor, services, or materials provided by the Contractor are not provided in compliance with the Contract Documents, then

the Contractor shall be provided a reasonable opportunity to cure the noncompliance or to compensate Owner for any failure to cure the noncompliance. No amount shall be added to the Contract Sum as a result of a dispute between Owner and Contractor unless and until such dispute is resolved in Contractor's favor.

§ 9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, then such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due to Owner, pursuant to the Contract, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, then the Owner shall have an absolute right to offset such amount against the Contract Sum and, in the Owner's sole discretion and without waiving any other remedies, may elect to either: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due to Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project (or if the same cannot be delivered for reasons not the fault or responsibility of the Contractor, nevertheless all Contractor's obligations necessary to the issuance of such certificates, permits, approvals, or licenses will have been performed.) Without limiting the foregoing, in general, the only remaining Work following Substantial Completion shall be minor in nature, so that the Owner could occupy the Project on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's normal school business operations.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect accompanied by the Owner or Owner's representative, at the Owner's option, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, then the Architect shall so notify the Contractor and Owner in writing, and the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.3.1 If, in Architect's opinion during the inspection, the Project, or the designated portion thereof which Owner has agreed to accept separately, is not sufficiently complete to warrant inspection, or if the list of items to be completed or corrected is not sufficiently complete to warrant inspection, then Architect may terminate the inspection and notify the Contractor that the Project is not ready for inspection. If for such reasons, Architect is required to make additional inspections, the Owner may deduct the cost of Architect's additional services made necessary thereby from any payments due the Contractor. The Architect's compensation shall be determined in accordance with the applicable provisions of the Agreement between the Owner and Architect.

§ 9.8.3.2 Except with the consent of the Owner, the Architect will perform no more than ONE (1) inspection to determine whether the Work has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect, Engineer, Consultant or service provider for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is Substantially Complete, as defined by the Contract Documents, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the

list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof, unless otherwise provided in the Certificate of Substantial Completion. If Work is to be completed or corrected after the date of Substantial Completion and prior to final payment, Warranties for Work to be completed or corrected after the date of Substantial Completion and prior to final payment shall become effective on the later of the date the Work is completed or corrected and accepted by the Owner and Architect, or the date of Final Payment. ("Warranty Commencement Date").

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

§ 9.8.6 Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to in writing by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work resulting from such occupancy, use or installation, and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties on the partially completed portion of the Work, as required by the Contract Documents.. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect. Contractor agrees that the Owner may place and install as much equipment and furnishings as is possible before completion or partial completion of portions of the Work.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless expressly agreed upon in writing, partial occupancy or use of a portion or portions of the Work or installation of furnishings and equipment shall not constitute acceptance of Work not complying with the requirements of the Contract Documents, nor shall it constitute evidence of Substantial Completion or Final Completion.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 When all of the Work is finally completed and the Contractor is ready for a final inspection it shall notify the Owner and the Architect thereof in writing. Thereupon, the Architect and Owner (at Owner's option) will make final inspection of the Work and, if the Work is complete in full accordance with the Contract Documents and this Contract has been fully performed, the Architect will promptly issue a final Certificate for Payment certifying to the Owner that the Work has been completed in accordance with the Contract Documents and that remainder of the Contract Sum, including all retainage, less any amount withheld pursuant to the Contract and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. Except with the consent of the Owner, the Architect will perform no more than one (1) inspection to determine whether the Work has attained Final Completion in accordance with the Contract Documents. If the Architect is unable to issue its final Certificate for Payment and is required to repeat its final inspection of the Work, the Contractor shall bear the cost of such repeat final inspection(s) which cost may be deducted by the Owner from the Contractor's final payment.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) its affidavit that payrolls, bills for materials and equipment, and other liabilities connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers'

warranties or specific Subcontractor warranties, and (6) except for amounts previously withheld by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may have been fully paid or otherwise satisfied; releases and waivers of liens from all Subcontractors of the Contractor and of any and all other parties required by the Architect or the Owner; such other provisions as Owner may request; and consent of Surety to final payment. If any third party fails or refuses to provide a release of claims or waiver of lien as required by Owner, the Contractor shall furnish a bond satisfactory to the Owner to discharge any such lien or indemnify the Owner from liability; (7) In addition, the following items must be completed and received by the Owner before Final Payment will be due:

- .1 Written certifications required by Sections 10.5, 10.6, and 10.7 herein;
- .2 Final list of subcontractors (AIA Document G705-2001);
- .3 Contractor's Certification of Project Compliance required by 16 Texas Administrative Code, Section 61.1036, located at: <https://tea.texas.gov>;
- .4 Contractor's warranties, organized as required elsewhere in the Contract Documents;
- .5 Maintenance and Instruction Manuals;
- .6 Owner's Certificate of Final Completion; and
- .7 "As-constructed record drawings". At the completion of the Project, the Contractor shall submit one complete set of "as-constructed" record drawings, with all changes made during construction, including concealed mechanical, electrical, and plumbing items. The Contractor shall submit these as electronic, sepi, or other acceptable medium, in the discretion of the Owner. The "as-constructed" record drawings shall delete the seal of the Architect and/or the Engineer and any reference to those firms providing professional services to the Owner, except for historical or reference purposes.

Documents identified as affidavits must be notarized. All manuals will contain an index listing the information submitted. The index section will be divided and identified by tabbing each section as listed in the index. Upon request, the Architect will furnish the Contractor with blank copies of the forms listed above.

§ 9.10.3 The Owner shall make final payment of all sums due the Contractor not more than thirty-one (31) days after the Architect's execution of a final Certificate for Payment. Final Payment shall not constitute a waiver of any Claims by the Owner.

§ 9.10.4

(Paragraphs deleted)
[Paragraph Deleted.]

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously asserted pursuant to Article 15 and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.10.6 The Contractor shall not permit any actual or purported lien, charge or claim to attach or attempt to attach to the Work, the site or any amounts due or to become due to the Contractor under the Contract Documents. If any such lien, charge or claim is so asserted, the Contractor shall promptly procure its release and indemnify the Owner against all damage and expense incident thereto. Upon completion of the Work and before any final payment and settlement, the Contractor shall provide evidence satisfactory to the Owner of payment and release of all debts, taxes, liens, charges, obligations and claims for or relating to labor, materials, Subcontractors and Sub-subcontractors; provided, however, that if the Contractor has not paid for any of the aforesaid as a result of a bona fide dispute, and payment of such is guaranteed and covered by the payment bond provided by the Contractor, then the Contractor shall not be required to pay such claim as a condition to final payment and settlement, but instead shall be required to provide Owner with written consent to final payment executed by such surety, expressly acknowledging the existence of such unpaid claim, and agreeing that full and final payment to the Contractor shall not impair any of the Owner's rights or the surety's obligations under the bond.

§ 9.11 Audit

Contractor agrees to maintain adequate books, payrolls and records satisfactory to the Owner in connection with any and all Work performed hereunder. Contractor agrees to retain all such books, payrolls and records (including data stored in computer) for a period of not less than three (3) years after completion of the Work. At all reasonable times,

Owner and its duly authorized representatives shall have access to all personnel of Contractor and all such books, payrolls and records, and shall have the right to audit same.

§ 9.12 In addition to any liquidated damages payable to the Owner by the Contractor, if: (1) the Architect is required to make more than one (1) inspection for Substantial Completion; (2) the Architect is required to make more than 1 inspection for Final Completion; or (3) the Work is not substantially complete within thirty (30) days after the date established for Substantial Completion in the Contract Documents; the Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections or services.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract and shall conform to all provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc., latest edition, and the Contractor further agrees to fully comply with all safety standards required by the Occupational Safety and Health Administration ("OSHA") 29 USC Section 651 et seq., and all amendments thereto. However, the Contractor's duties herein shall not relieve any Subcontractor or any other person or entity, including any person or entity required to comply with all applicable federal, state and local laws, rules, regulations, and ordinances, from the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.1.1 Contractor shall ensure that the Project site is alcohol-free, drug-free, nicotine/ tobacco-free, e-cigarette free, weapon-free, and sexual-harassment free, and shall require strict compliance on the Project Site with the Owner's Board Policies, including but not limited to GKA(Legal) and GKA(Local). Contractor will remove any of its employees from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such employee, and at any time an incident occurs where drug or alcohol use could have been a contributing factor. Owner has the right to require Contractor to remove employees from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, Contractor's employees may only be considered for return to work after the Contractor certifies as a result of a for-cause test, conducted immediately following removal that said employee was in compliance with this contract. Contractor will not use an employee to perform the Work who either refuses to take, or tests positive in, any alcohol or drug test.

10.1.2 Dress Code, Fraternalization and Sexual Harassment. Contractor shall require adequate dress of the Contractor's forces consistent with the nature of the Work being performed, including wearing shirts at all times. Contractor shall prohibit fraternization between all persons working under Contractor or any of its subcontractors, students and Owner's employees while on Owner's property. Sexual harassment of employees of the Contractor or employees or students of the Owner by employees of the Contractor is strictly forbidden. Any employee of the Contractor who is found to have engaged in such conduct shall be subject to appropriate disciplinary action by the Contractor, including removal from the job site.

§ 10.1.3 Weapons. Owner has also banned use, possession, or display of any firearm, handgun, location-restricted knife, club, or "prohibited weapon", as defined by the Texas Penal Code and Owner's Board Policy FNCG(Legal), except when the Contractor, its representatives, employees, agents, and subcontractors, or anyone else over which the Contractor has control or authority holds a Texas handgun license, stores the handgun or other firearm in a locked vehicle in the Owners parking lot, garage, or other parking area provided by the Owner AND the firearm is not loaded and not in plain view. A copy of such policy is available through a link on the Owner's website. The Contractor further agrees that Contractor's representatives, employees, agents, and subcontractors will abide by these requirements as well as the Federal Gun-Free School Zones Act.

§ 10.1.4 Tobacco and E-Cigarettes. Contractor's employees, agents, Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, shall not use e-cigarettes or tobacco products while on the Project Site.

§ 10.1.5 Small Unmanned Aircraft (Drones). The Contractor shall operate any Small Unmanned Aircraft as required by 14 C.F.R. Part 107. as applicable, and any other applicable federal or state laws and regulations.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall maintain good order among its employees and its Subcontractors, shall confine its employees and Subcontractors to such work areas, roads and gates as directed by the Owner, take reasonable and necessary precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work, school personnel, students and other persons on the Owner's premises and other persons who may be affected thereby, which protection shall include the installation of fencing between the Work site and the occupied portion of a connecting or adjacent educational facility, and taking reasonable precautions to secure any abusable glue, aerosol paint, or any other chemical substance for inhalation being used on the project site;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as fences, trees, shrubs, lawns, walks, athletic fields and tracks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction. Contractor's obligations under this Section shall continue to apply during any time period when all or a portion of the Work is suspended for any reason. Contractor's obligations under Section 10.2 as to each portion of the Project shall continue until Owner takes possession of and occupies that portion of the Project.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including installing fencing, posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.2.4 When use or storage of hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel, and shall only conduct such activities after giving reasonable advance written notice of the presence or use of such materials, equipment or methods to Owner and Architect. The storage of explosives on Owner's property is prohibited. The use of explosive materials on Owner's property is prohibited unless expressly approved in advance in writing by Owner and Architect.

§ 10.2.5 [Paragraph Deleted.]

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

§ 10.2.8.1 If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 3 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. No provision of the Contract Documents shall waive Owner's immunity under the Texas Tort Claims Act, Texas Civil Practice and Remedies Code, Chapter 101.

§ 10.2.8.2 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work which cause death, bodily injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious bodily injuries, or serious property damages are caused, then the accident shall be reported immediately by any means necessary to give actual notice to the Owner's representative and the Architect.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition. If such notice is provided orally, written confirmation of such notice by Contractor shall be provided not later than one (1) business day following such notification. Owner shall not be responsible for materials or substances brought to the site by the Contractor.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall, as soon as reasonably possible, obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. Contractor may be entitled to an extension of the Contract Time in accordance with Article 8.3.

§ 10.3.3 To the extent permitted by the laws and Constitution of the State of Texas, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity. Notwithstanding anything to the contrary contained in this Section 10.3.3, the agreement of the Owner to indemnify, defend and hold harmless the parties described in this Section shall not extend or apply to claims, damages, losses, expenses or liabilities related to, created or caused in whole or in part by a party indemnified hereunder; it being agreed and understood that the Owner and any party so indemnified shall each bear liability for its own negligent acts or omissions, and that such indemnity shall extend only to liability for the negligent acts and omissions of the Owner.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents.

§ 10.3.5 Except to the extent that the cost and expense are due to the Owner's fault or negligence, if Contractor imports hazardous materials onto the Project site, the Contractor shall indemnify and hold harmless the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, (2) where the Contractor fails to perform its obligations under Section 10.3.1; and (3) any fines or penalties of government agencies directly resulting from the Contractor's importation of the hazardous materials onto the Project site.

§ 10.3.6 [Paragraph Deleted.]

§ 10.4 Emergencies

§ 10.4 .1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

§ 10.4.2 The performance of the foregoing services by the Contractor shall not relieve the subcontractors of their responsibility for the safety of persons and property and for compliance with all federal, state and local statutes, rules, regulations and orders of any governmental authority applicable to the conduct of the Work.

§ 10.5 Asbestos Or Asbestos-Containing Materials. Contractor shall submit to the Architect a written certification addressed to the Owner that all materials used in the construction of this Project contain less than 0.10% by weight of asbestos and for which it can be demonstrated that, under reasonably foreseeable job site conditions, will not release asbestos fibers in excess of 0.1 fibers per cubic centimeter. The written certification shall further state that, should asbestos fibers be found at this Project in concentrations greater than 0.1 fibers per cubic centimeter, then Contractor shall be responsible for determining which materials contain asbestos fibers and shall take all necessary corrective action to remove those materials from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor. Final Payment shall not be made until this written certification has been received.

§ 10.6 Lead-Free Material In Potable Water System

§ 10.6.1 Prior to payment of retainage and final payment, the Contractor and each subcontractor involved with the potable water system shall furnish a written certification that the potable water system is "lead-free".

§ 10.6.2 The written certification shall further state that should lead be found in the potable water system built under this Project, then Contractor shall be responsible for determining which materials contain lead and shall take all necessary corrective action to remove lead from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor.

§ 10.7 Hazardous Materials Certification

The Contractor shall provide written certification that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by federal, state or local standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards; and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The Contractor shall provide this written certification as part of submittals under the Section in the Project Manual related to Contract Closeout.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance

§ 11.1.1 The Contractor and the Contractor's Subcontractors shall purchase and maintain in force, insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the table below the Agreement or elsewhere in the Contract Documents. No Work will be commenced, and no equipment or materials may be shipped, until all requirements of Article 11 have been satisfied, satisfactory evidence of insurance has been provided, and all required insurance is in full force and effect. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the State of Texas.

Workmen's Compensation: (Including Waiver of Subrogation Endorsement)	All liability arising out of Contractor's employment of workers and anyone for whom Contractor shall be liable for Worker's Compensation claims. Worker's Compensation is required and no "alternative" form of insurance shall be permitted.
Employer's Liability:	\$1,000,000.00

Commercial General Liability: Each Occurrence General Aggregate Personal & Advertising Injury Products and Completed Operations	\$1,000,000.00 \$2,000,000.00 (A Designated Construction Project General Aggregate Limit shall be provided) \$1,000,000.00 each person \$1,000,000.00 (for one (1) year, commencing with issuance of final Certificate for Payment)
Property Damage Independent Contractors Contractual Liability	\$1,000,000.00 each occurrence \$2,000,000.00 aggregate (Same limits as above) (Same limits as above)
Automobile Liability: Bodily Injury/Property Damage	\$1,000,000.00 combined single limit \$1,000,000.00 each occurrence
Umbrella or Excess Liability	\$5,000,000.00 each occurrence/aggregate
All Risk Builders Risk against the perils of fire, lightning, windstorm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, vandalism, malicious mischief, and all other perils in the amount one hundred percent (100%) of the value of the improvements including transit and materials stored off site. Additionally, this coverage shall provide protection to the full replacement value for boiler and machinery equipment up to installation, during testing, and until acceptance by Owner.	
Professional Liability for Construction Manager-At-Risk. In addition to the coverage and limits provided above, if these General Conditions are incorporated into the AIA Document A133™–2019 Standard Form of Agreement Between Owner and Construction Manager as Constructor <i>where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price</i> , the Construction Manager shall also provide Professional Liability Insurance covering negligent acts, errors and omissions in the performance of professional services during the pre-construction phase, with policy limits of not less than One Million Dollars (\$\$1,000,000.00) per claim and Two Million Dollars (\$\$2,000,000.00) in the aggregate.	

§ 11.1.2 The required insurance must be written by a company licensed to do business in Texas at the time the policy is issued. In addition, the company must be acceptable to the Owner.

§ 11.1.3 The General Liability and Automobile policies so issued in the name of Contractor shall also name the Owner as additional insured. The coverage afforded to the additional insured under the policy or policies shall be primary insurance. It is the intent of the parties to this Agreement that the General Liability coverage (and associated Umbrella Coverage) required herein shall be primary to and shall seek no contribution from all insurance available to Owner, with Owner's insurance being excess, secondary and non-contributing. The Commercial General Liability coverage provided by Contractor shall be endorsed to provide such primary and non-contributing liability. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis.

§ 11.1.4 If the insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payment made by the insurance carrier on claims paid by this insurance. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner then the Contractor shall bear all reasonable costs properly attributable thereto.

§ 11.1.5 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. Nothing contained herein shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.

§ 11.1.6 Contractor shall have its insurance carrier(s) furnish to Owner insurance certificates in form satisfactory to Owner specifying the types and amounts of coverage in effect, the expiration dates of each policy, and a statement that no insurance will be canceled or materially changed while the Work is in progress without thirty (30) calendar day's prior written notice to Owner. Contractor shall permit Owner to examine the insurance policies, or at Owner's option, Contractor shall furnish Owner with copies, certified by the carrier(s), of insurance policies required in Section 11.1.1. If Contractor neglects or refuses to provide any insurance required herein, or if any insurance is canceled, Owner may, but shall not be obligated to, procure such insurance and the provisions of Section 11.1.8 hereof shall apply.

§ 11.1.7 Contractor and its Subcontractors shall not commence the shipment of equipment or materials or commence the Work at the site until all of the insurance coverage required of Contractor and its Subcontractors are in force and the necessary certificates and statements pursuant to Section 11.1.6 hereof have been received by Owner and the Architect has issued a written notice to proceed.

§ 11.1.8 As an alternative and at Owner's option and expense, Owner may elect to furnish or to arrange for any part or all of the insurance required by Section 11.1 hereof. If Owner so elects, it shall notify, in writing, Contractor and issue a Change Order therefor, but no adjustment to the scheduled completion date or the Contract Sum shall be allowed.

§ 11.1.9 Workers' Compensation Insurance Coverage.

.1 Definitions:

.1.1 Certificate of coverage ("Certificate"). A copy of a certificate of insurance, a certificate of authority to self-insure issued by the division, or a coverage agreement (DWC Form-81, DWC Form-82, DWC Form-83, or DWC Form-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on the Project, for the duration of the Project.

.1.2 Duration of the Project. Includes the time from the beginning of the work on the Project until the Contractor's work on the Project has been completed and accepted by the Owner.

.1.3 Persons providing services on the Project ("subcontractor" in Texas Labor Code §406.096). Includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person contracts directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. "Services" does not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

.2 The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the Project, for the duration of the Project.

.3 The Contractor must provide a certificate of coverage to the Owner prior to being awarded the contract.

.4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the Owner showing that coverage has been extended.

.5 The Contractor shall obtain from each person providing Services on a Project, and provide to the Owner:

.5.1 a certificate of coverage, prior to that person beginning work on the Project, so the Owner will have on file certificates of coverage showing coverage for all persons providing services on the Project; and

.5.2 no later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

.6 The Contractor shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.

.7 The Contractor shall notify the Owner in writing by certified mail or personal delivery, within ten (10) days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.

- .8 The Contractor shall post on each Project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.
- .9 The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:
- .9.1 provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project;
 - .9.2 provide to the Contractor, prior to that person beginning work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project, for the duration of the Project;
 - .9.3 provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
 - .9.4 obtain from each other person with whom it contracts, and provide to the Contractor:
 - (a) a certificate of coverage, prior to the other person beginning work on the Project; and
 - (b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
 - .9.5 retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;
 - .9.6 notify the Owner in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
 - .9.7 contractually require each person with whom it contracts, to perform as required by Subparagraphs .9.1 - .9.7 with the certificates of coverage to be provided to the person for whom they are providing services.
- .10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the Owner that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the Texas Department of Insurance, Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.
- .11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the Owner to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the Owner. [28 TAC §110.110(c)(7)]

§ 11.1.10 The Owner and Contractor shall waive all rights against (1) each other and the Contractors, Subcontractors, agents and employees each of the other, and (2) the Architect and separate Contractors, if any, and their contractors, Subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance applicable to the Work. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by Section 3.18.3. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, contractors and Subcontractors by appropriate agreements, written where legally required for validity, similar waivers, each in favor of all other parties enumerated in this Section 11.1.10.

§ 11.2 Owner's Insurance [Paragraph Deleted.]

(Paragraphs deleted)

§ 11.3 Waivers of Subrogation [Paragraph Deleted.]

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the

Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

(Paragraphs deleted)

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PERFORMANCE BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum.

§ 11.4.2 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PAYMENT BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum as security for payment of all persons performing labor and furnishing materials in connection with this Contract. (Bonding Company is to furnish such forms). All bonds shall name the Owner as additional obligee.

§ 11.4.3 The Payment and Performance Bond shall meet requirements of Chapter 2253 of the Texas Governmental Code. All bonds shall be issued by a surety company licensed, listed and authorized to issue bonds in the State of Texas by the Texas Department of Insurance. The surety company may be required by the Owner to have a rating of not less than "B" in the latest edition of Best's Insurance Reports, Property-Casualty. The surety company shall provide, if requested, information on bonding capacity, other projects under coverage and shall provide proof to establish adequate financial capacity for this Project. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, the surety company issuing the bond shall certify that the surety company has acquired reinsurance, in a form and amount acceptable to the Owner, to reinsure the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by an reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus.

§ 11.4.4 The Sureties shall promptly file a signed copy of the Contract, Performance Bond, and Payment Bond with the Owner in full compliance with Chapter 2253 of the Texas Governmental Code or, in the case of a Construction Manager, as required by Section 14.3.3 of the AIA Document A133-2019.

§ 11.4.5 All bonds will be reviewed by the Architect for compliance with the Contract Documents prior to execution of the contract. In the event that the Architect has any questions concerning the sufficiency of the bonds, the bonds will be referred to the Owner or the Owner's representative for review and decision.

§ 11.4.6 All bonds shall be originals. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power-of-Attorney. The name, address, and telephone number of a contact person for the bonding company shall be provided.

§ 11.4.7 Upon the request in writing of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

§ 11.4.8 Bonds shall be signed by an agent resident in the State of Texas and the date of the bond shall be the date of execution of the contract. If at any time during the continuance of the contract, the surety of the Contractor's bonds becomes insufficient, Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) business days after notice to do so. In default thereof, the Contractor may be suspended, and all payment or money due to the Contractor withheld.

§ 11.4.9 By inclusion of this Section 11.4.8 in the Contract Documents, the surety which issues the bonds is hereby notified that the Owner, the Architect, and their agents and employees do not represent and will not be responsible for the surety's interests during the course of the Work. To protect its interests, the surety shall have the right to attend pay

estimate meetings, review Applications for Payment when requested in writing by them, comment upon and make recommendations regarding payments, and inspect the Work in the presence of the Contractor and the Architect. By providing the bonds for the Work, the surety shall and hereby waives any cause of action against the Owner, the Architect, their agents and employees, for any loss suffered by the surety by reason of overpayment of any amounts to the Contractor, unless such is a direct result of a fraudulent or grossly negligent act committed by such party.

§11.5 Adjustment and Settlement of Insured Loss [Paragraph Deleted.]

(Paragraphs deleted)

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered prior to inspection, contrary to the Architect's request or to requirements specifically expressed in the Contract Documents or if any known deficiencies exist, it must, if requested by the Architect, be uncovered by the Contractor for the Architect's examination and be replaced at the Contractor's sole expense without change in the Contract Time. If the uncovered work is determined by the Architect upon inspection to be deficient or not in accordance with the Contract Documents, the uncovered Work which is deficient or not in accordance with the Contract Documents shall be corrected and covered at the Contractor's sole expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense. If the a request inspection of the Work prior to covering or including a requirement for inspection in the Contract Documents is within the Architect's standard of care and the Architect has failed to timely make such request or include the requirement in the Contract Documents, the Architect shall reimburse the Owner for the actual costs of uncovering and recovering such Work and additional costs of correction, if any, caused by covering the Work prior to inspection.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense and will be subject to offset by the Owner at Final Payment.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Owner shall give such notice of the condition to the Contractor with reasonable promptness after discovery of the condition. The Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition in its non-conforming state. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor based on a breach of the warranty contained in this Section 12.2.2.1 providing for correction of Work during the one-year period. If the Contractor fails to correct nonconforming Work within a reasonable time during the period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

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§ 12.2.2.4 Upon request by the Owner and prior to the expiration of one (1) year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.2.6 Contractor shall (i) re-execute any parts of the Work that fail to conform with the requirements of this Agreement that appear during the progress of the Work; (ii) remedy any defects in the Work due to faulty materials or workmanship which appear within a period of one (1) year from Substantial Completion of the Work hereunder, or within such longer period of time as may be set forth in the Drawings and Specifications or other Contract Documents; and (iii) replace, repair, or restore any parts of the Project or furniture, fixtures, equipment, or other items placed therein (whether by Owner or any other party) that are injured or damaged by any such parts of the Work that do not conform to the requirements of the Contract Documents or defects in the Work or by the negligent act of the Contractor or its employees, agents or subcontractors. The cost to Contractor of performing any of its obligations under this Section 12.2.6 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.7 The provisions of this Section 12.2 apply to Work done by Subcontractors of the Contractor as well as Work done directly by employees of the Contractor. The provisions of this Section 12.2.7 shall not apply to corrective Work attributable solely to the acts or omissions of any separate Contractor of Owner (unless Contractor is acting in such capacities). The cost to Contractor of performing any of its obligations under this Section 12.2.7 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.8 If, however, Owner and Contractor deem it inexpedient to require the correction of Work damaged or not done in accordance with the Contract Documents, an equitable deduction from the Contract Sum shall be made by written agreement between Contractor and Owner. Until such settlement, Owner may withhold such sums as Owner deems just and reasonable from moneys, if any, due Contractor. The settlement shall not be unreasonably delayed by the Owner and the amount of money withheld shall be based on estimated actual cost to the Owner of the correction.

§ 12.2.9 Contractor's express warranties set out in this Article 12 shall be in addition to, and not in lieu of, any other warranties or remedies Owner may have under the Contract Documents, at law, or in equity for defective Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the laws of the State of Texas without regard to choice-of-law rules of any jurisdiction. The Contract is deemed performable entirely in the County in which the Project is located. Any litigation to enforce or interpret any terms of the Contract, or any other litigation arising out of or as a result of the Contract, shall be brought in the State courts of said County. No provision of this Agreement shall waive any immunity or defense.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract in whole or in part without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender or other entity providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.2.3 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability, or effect of the remainder of the Contract Documents.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made at appropriate times as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities having jurisdiction. Except for tests, inspections and approvals required to be provided by the Contractor in the Contract Documents, the Owner will contract for, independently of the Contractor, the inspection services, the testing of construction materials engineering, and the verification testing services necessary for the acceptance of the Work by the Owner. The Contractor shall give timely notice to the persons or entities selected by the Owner of the need for such services. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense. Architect, Owner and Contractor shall cooperate for the timely scheduling of such tests and inspections.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including but not limited to those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Undisputed payments due and unpaid under the Contract Documents shall bear interest in accordance with the Texas Prompt Payment Act, Texas Gov't Code Chapter 2251. Any such payment shall be deemed overdue on the thirty-first (31st) day after Owner receives the Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets more than once per month. Any such payment shall be deemed overdue on the forty-sixth (46th) day after Owner receives the Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets once a month or less frequently. No interest shall be due on sums properly retained by Owner, except as provided by law, or on disputed sums unpaid by Owner.

§ 13.6 Equal Opportunity In Employment

§ 13.6.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, age, disability, sex, national origin, or any class otherwise protected by District policy or law. The Contractor agrees to post in conspicuous places, available to employees and applicants, notices setting forth the Contractor's nondiscrimination policies.

§ 13.6.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, age, disability, sex, national origin, or any class otherwise protected by District policy or law.

§ 13.7 Contractors Records

§ 13.7.1 Contractor agrees to furnish Owner such information as may be available in Contractor's files and records for the Project for the purpose of aiding Owner in establishing a depreciation schedule for the Project or such portions thereof as Owner may determine.

§ 13.7.2 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, payment records, payroll record, daily reports, diaries, logs, instructions, drawings, receipts, contracts, purchase orders, vouchers, memoranda, other financial data and job meeting minutes applicable to the Project, in a manner which maintains the integrity of the documents. Job Records must be retained by Contractor for at least twelve (12) years after the date of Final Completion of the Project. Within ten (10) days of Owner's request, Contractor shall make such Job Records available for inspection, copying and auditing by the Owner, Architect or their respective representatives, at Owner's central office or the principal offices of the Contractor, at the sole option of the Owner.

§ 13.7.3 For all Change Orders, Allowances and expenditures from Contingency Funds, Contractor shall also maintain, in accordance with the provisions of Section 13.9.1, the following: contract files, including proposals of successful and unsuccessful bidders, bid recaps and contractor payments; original estimates; estimating Work sheets; general ledger entries detail cash and trade discounts received; insurance rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges related to the Contract.

§ 13.7.4 Contractor shall keep a full and detailed financial accounting system and shall exercise such controls as may be necessary for proper financial management under this Contract; the accounting and control system shall be satisfactory to the Owner and shall be subject to the provisions of Section 13.7.1.

§ 13.7.5 Contractor shall keep all Construction Documents related to the Project, provided, however, Contractor shall not destroy said documents until Contractor has confirmed with Owner in writing that Owner has obtained a copy of all as-built drawings.

§ 13.7.6 In the event that an audit by the Owner reveals any errors/overpayments by the Owner, then the Contractor shall refund to the Owner the full amount of such overpayment within thirty (30) days of such audit findings, or the Owner, as its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.8 No Third-Party Beneficiaries

There are no third-party beneficiaries to this agreement.

§ 13.9 Proprietary Interests And Confidential Information

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§ 13.9.1 Neither Architect nor Contractor shall use the image or likeness of Owner's Project or Owner's official logo or emblem and any other trademark, service mark, or copyrighted or otherwise protected information of Owner, without Owner's prior written consent. Contractor and Architect shall not have any authority to advertise or claim that Owner endorses Architect or Contractor's services, without Owner's prior written consent.

§ 13.9.2 Neither Architect nor Contractor shall disclose any confidential information of Owner which comes into the possession of Architect or Contractor at any time during the Project, including but not limited to: pending real estate purchases, exchange, lease, or value; information related to litigation; detailed layouts of the Owner's Facilities; the location and deployment of security devices; security access codes; student likenesses; student record information; employee information; or any other information deemed confidential by law.

§ 13.9.3 The parties acknowledge that, as a public entity in the State of Texas, Owner is subject to, and must comply with, the provisions of the Texas Public Information Act, Texas Government Code Section 552.001, *et seq.*, and the Texas Open Meetings Act, Texas Government Code, Section 551.001, *et seq.*

§ 13.10 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability or effect of the remainder of the Contract Documents.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 If the Work is stopped for a period of thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor for any of the reasons set forth below, the Contractor may terminate the Contract upon twenty (20) days written notice to Owner and Architect if the Work is not allowed to commence within such period. The sole grounds for termination under this Subsection 14.1.1 are as follows:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Owner has not made payment of undisputed sums due on an approved Certificate for Payment within the time stated in the Contract Documents; or
- .4 [Subsection Deleted.]

§ 14.1.2 If through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less, the Contractor may terminate the Contract so long as Contractor has provided Owner and Architect with written notice of its intent to terminate in the event of additional delays of not less than twenty (20) days and has furnished written notice of termination to Owner and Architect no less than seven (7) days prior to the effective date of termination.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment in an amount which would have been recoverable had the termination been for the Owner's convenience.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon ten (10) additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 fails to proceed continuously and diligently with the construction and completion of the Work; except as permitted under the Contract Documents;
- .5 fails to furnish the Owner, upon written request, with assurances satisfactory to the Owner, evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;
- .6 engages in or permits serious or repeated worker misconduct in violation of Article 3.3;
- .7 engages in conduct that would constitute a violation of state or federal criminal law, including but not limited to, the laws prohibiting certain gifts to public servants, or engages in conduct that would constitute a violation of the Owner's ethics or conflict of interest policies; or
- .8 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, subject to any prior rights of the surety, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient.

In any such event, title to the Work and any products thereof, whether completed or partially completed, as well as all materials prepared, procured or set aside by the Contractor for use in the Work, shall vest in the Owner at the Owner's option, and the Owner may enter the Contractor's premises and remove the same therefrom. No election hereunder shall be construed as a waiver of any rights or remedies of the Owner with regard to any breach of the Contract Documents.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. Any further payment shall be limited to amounts actually earned to the date of termination.

§ 14.2.4 If the costs of finishing the Work, including compensation for the Architects' services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, exceed the unpaid balance of the Contract Sum or Guaranteed Maximum Price (if the Project is a Construction Manager at Risk project), then the Contractor and/or its Surety shall pay the difference to the Owner. The amount to be paid to the Owner shall be certified by Architect upon application. The obligation for payment shall survive termination of the Contract.

§ 14.2.5 The parties hereby agree that: 1) if an order for relief is entered on behalf of the Contractor, pursuant to Chapter 11 of the U.S. Bankruptcy Code; 2) if any other similar order is entered under any debtor relief laws; 3) if Contractor makes an assignment for the benefit of one or more of its creditors; 4) if a receiver is appointed for the benefit of its creditors; or 5) if a receiver is appointed on account of its insolvency, any such event could impair or frustrate Contractor's performance of the Contract Documents. Accordingly, it is agreed that upon occurrence of any such event, Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of the Contract Documents. Failure to comply with such request within ten (10) days of delivery of the request shall entitle Owner to terminate the Contract and to the accompanying rights set forth in Subparagraphs 14.2.1 through 14.2.6. In all events, pending receipt of adequate assurance of performance and actual performance in accordance with the Contract Documents, Owner shall be entitled to proceed with the Work with Owner's own forces or with other Contractors on a time and material or other appropriate basis, the cost of which will be charged against the Contract Sum.

§ 14.2.6 As required by Texas Government Code Chapter 2253, if a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, then the Surety shall promptly perform the Work, in full accordance with the plans, specifications and Contract Documents. Unless otherwise agreed in writing between the Surety and the Owner, the Surety shall complete the Work by the Surety entering into a Contract acceptable to Owner, with a Contractor acceptable to Owner, and shall obtain new Payment and Performance Bonds as required by law.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time may be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

Furthermore, if this Contract is a multi-year contract funded through Owner's current general funds that are not bond funds, then the Owner's Board of Trustees has the right to not appropriate adequate monies for the next fiscal year and to terminate this Contract at the end of each fiscal year during the term of the Contract, without the Owner incurring any further liability to Contractor as a result of such termination.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed, for profit only on that portion of the Work executed, and reasonable costs of demobilization.

§ 14.4.4 Upon determination by a Court of competent jurisdiction that termination of the Contractor pursuant to Section 14.2 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Section 14.4, and Contractor's remedy for wrongful termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in this Section 14.4.3.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims [Paragraph Deleted.]

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by the Contractor, shall be initiated by notice to the Owner and to the Architect, Claims under this Section 15.1.3.1 shall be initiated within 21 calendar days after the occurrence of the event giving rise to such Claim or within 21 calendar days after the claimant first knew or should have known of the condition giving rise to the Claim, whichever is earlier. If the full impact cannot be assessed as of the date of the Notice, then Notice shall be provided and amended by a second notice at the earliest date that is reasonably possible, but in no event later than the date of Contractor's Application for Payment covering the period in which the impact can be assessed and quantified.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required. If Texas Government Code, Chapter 2272 is applicable to the Claim, the Owner shall comply with the requirements set out therein as a condition precedent to any initiation of any litigation.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make undisputed payments for Work performed in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum (or Guaranteed Maximum Price, as applicable), if permitted, and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of the Contractor to proceed in accordance with this Article 15.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum (provided such a claim is specifically permitted by the Contract Documents), notice as provided in Section 15.1.3 shall be given to the Owner and Architect. before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. The Architect will promptly investigate such Claim and report findings and a recommended resolution in writing to the Owner and Contractor. If the Claim is approved by Owner, then Contractor shall proceed with the execution of the Work that is the subject matter of the Claim. If the Claim is rejected by the Owner, then Contractor may pursue alternative dispute resolution as provided for in the Contract Documents.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. § 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions occurred at the locality of the Work which were abnormal for the period of time, were in excess of that normally experienced at the job site, could not have been reasonably anticipated, and prevented the execution of Work on scheduled Working Days. The term "Adverse Weather Conditions" as used herein means unusually severe weather which is beyond the normal weather recorded and expected for the locality of the Work and/or the season or seasons of the year. Normal weather conditions shall be determined based upon information compiled from the Local Climatological Data maintained by NOAA's National Centers for Environmental Information [formerly the National Climatic Data Center (NCDC)] from the station closest to the location of the Work. No day will be counted as a rain-day when substantial Contractor forces are able to perform Work on the Project for more than fifty percent (50%) of the usual workday or when the stage of the Work on the Project is not adversely impacted. The Contractor shall bear the entire economic risk of all weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of the Contract Time pursuant to this Subparagraph shall be submitted to the Architect not later than the fifteenth (15th) day of the month following the month during which the delays or disruptions occurred, but shall be applied only to the extent that Substantial Completion of the Project exceeds the Substantial Completion date established for the Work. As provided herein, Contractor shall only be entitled an extension of the Contract Time per the terms of the Contract Documents and no damages shall be paid for delays.

(Paragraphs deleted)

§ 15.1.7 Calculating Claims For Damages

Except as otherwise provided in this Agreement, in calculating the amount of any Claim recoverable by the Contractor, the following standards will apply:

- .1 No indirect or consequential damages will be allowed.
- .2 No recovery shall be based on a comparison of planned expenditures to total actual expenditures, or on estimated loss of labor efficiency, or on a comparison of planned manloading to actual manloading, or any other analysis that is used to show damages indirectly.
- .3 Damages are limited to extra costs specifically shown to have been directly caused by a proven wrong.

- .4 No damages will be allowed for home office overhead or other home office changes or any Eichlay formula calculation.

Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents, nor will this Section 15.1.7 be deemed to apply to delay damages, which are prohibited entirely.

§ 15.2 Initial Decision

§ 15.2.1 Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect but excluding those arising under Section 10.3, shall be referred initially to the Architect for consideration and recommendation to the Owner. An initial recommendation by the Architect shall be required as a condition precedent to mediation of any Claim, after the Claim has been referred to the Architect with no recommendation having been rendered by the Architect.

§ 15.2.2 The Architect will review Claims and within ten (10) days of receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the Contractor; (2) issue an initial recommendation; (3) suggest a compromise; or (4) advise the parties that the Architect is unable to issue an initial recommendation due to a lack of sufficient information or conflict of interest.

§ 15.2.3 Following receipt of the Architect's initial recommendation regarding a claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Price and/or Contract Time. If no agreement can be reached either party may request mediation of the dispute pursuant to Article 15.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished.

§ 15.2.5 [Paragraph Deleted.]

§ 15.2.6 [Paragraph Deleted.]

§ 15.2.6.1 [Paragraph Deleted.]

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 Waiver Of Lien

It is distinctly understood that by virtue of this Contract, no mechanic, contractor, materialman, artisan, or laborer, whether skilled or unskilled, shall ever in any manner have, claim, or acquire any lien upon the building, or any of the improvements of whatever nature or kind so erected or to be erected by virtue of this Contract nor upon any of the land upon which said building or any of the improvements are so erected, built, or situated.

§ 15.3 Mediation

§ 15.3.1 In the event that the Owner or the Contractor shall contend that the other has committed a material breach of this Agreement, the party alleging such breach shall, as a condition precedent to filing any lawsuit, request mediation of the dispute. Mediation shall be subject to and in accordance with Chapter 154 of the Texas Civil Practice & Remedies Code. Mediation shall be conducted by a mutually-agreed-upon mediator qualified as an impartial third party for purposes of Section 154.052 of the Texas Civil Practice & Remedies Code.

§ 15.3.2 Request for mediation shall be in writing, and shall request that the mediation commence not less than thirty (30) or more than ninety (90) days following the date of the request, except upon agreement of both parties.

§ 15.3.3 In the event the Owner and the Contractor are unable to agree to a date for the mediation or to the identity of the mediator or mediators within thirty (30) days following the date of the request for mediation, all conditions precedent in this article shall be deemed to have occurred.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.3.5 Nothing herein shall preclude the Owner or the Contractor or as applicable, the Construction Manager from requesting that the Architect or one or more subcontractors be joined as parties to the mediation, to the extent allowed by their respective contracts.

§ 15.3.6 Any claim not resolved in mediation pursuant to Section 15.3 shall be subject to litigation as the sole method of dispute resolution.

§ 15.3.7 Unless otherwise agreed in writing by the Owner in the Owner's sole discretion, the Contractor may not bring a legal action against the Owner unless:

- .1 the Contractor has given written notice to the Owner of the Claim, dispute, or other matter giving rise to the legal action within ninety-one (91) days after the date of the start of the event giving rise to the Contractor's Claim, dispute or other matter, and
- .2 the legal action is brought within two (2) years and one (1) day after the date of the start of the event giving rise to Contractor's Claim, dispute or other matter.

§ 15.4 Arbitration. This Section 15.4 and all subparts are intentionally deleted. No dispute arising under the Contract Documents, these General Conditions or the underlying Contract shall be subject under any circumstances to Arbitration as the method of binding dispute resolution and Owner rejects any selection otherwise made by the parties.

§ 15.5 Immunity

Contractor stipulates that Owner is a political subdivision of the State of Texas and, as such, may enjoy immunities from suit and liability under the Constitution and laws of the State of Texas. By entering into this Agreement, Owner does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein and as specifically provided by law.

Executed on this the ____ day of _____, 20__.

MIDLOTHIANINDEPENDENT SCHOOL DISTRICT		_____
OWNER <i>(Signature)</i>		CONTRACTOR <i>(Signature)</i>
Dr. Jo Ann Fey, Superintendent of Schools		
<i>(Printed name and title)</i>		<i>(Printed name and title)</i>

(Paragraphs deleted)

Additions and Deletions Report for

AIA® Document A201® – 2017

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2122-005 Stadium Additions & Renovations

1800 South 14th Street
Midlothian, Texas 76065

...

(Name, legal status and address)

Midlothian Independent School District, a public school district and political subdivision of the State of Texas
100 Walter Stephenson Road
Midlothian, Texas 76065
Phone: 469-856-5000
Fax: 972-775-1757
E-mail: rola.fadel@misd.gs

...

Orcutt Winslow
2929 N Central Avenue, 11th Floor
Phoenix, AZ 85012
Phone: 602-257-1764
E-mail: harlanb@owp.com

THE CONTRACTOR

_____, a _____ of the State of _____
[Address]
[Address continued]
Phone: _____
E-mail: _____

NOTE: Any reference hereinafter this one, to an AIA™ Document or any AIA Documents included in the Contract Documents shall refer to such document "as modified for this Project". In addition, any reference to AIA Documents shall all be considered to have included the Trademark "TM" after the AIA reference, whether or not included in the text. The AIA Documents are registered intellectual property of the American Institute of Architects and use and amendment of such forms is permitted under license granted to Walsh Gallegos Trevino Kyle & Robinson, P.C. for this Project. No use may be made of this AIA document other than as Contract Documents for this Project.

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The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, Project Manual and the Bid or Proposal Documents prepared and submitted by the Owner and the Contractor's Bid or Proposal submitted by the Contractor, to the extent they do not conflict with the terms of this Agreement, and other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements. The Contract Documents identified in this Section shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic operations. In the absence of individual signatures by Owner and Contractor, the Contract Documents identified in the signed contract prevail.

...

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. ~~The Contract may~~ After execution of the Original Contract Documents, the Contract may thereafter be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

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§ 1.1.9 The terms "bids" or "bidding" shall include any kind of competitive purchasing under the Texas Education Code Chapter 44 and Texas Government Code Chapter 2269.

§ 1.1.10 Miscellaneous Other Words**§ 1.1.10.1 Business Day**

The term "business day" is a day the Owner's Administration Building is scheduled to be open for normal business purposes, unless closed by the Owner's Superintendent of Schools for inclement weather or other reason. Days on which the Administration Building is normally closed are Thanksgiving Break, Winter Break, Spring Break, and Summer Break, as well as other federal, state or local days specified in the calendar approved by the Owner's Board of Trustees on an annual basis. A business day does not include a day on which the Owner's Administration Building is open only for the purposes of conducting candidate filing, early voting, elections, or special events.

§ 1.1.10.2 Calendar Day

A calendar day is a day on the Gregorian calendar. The Contact Time is established in calendar days. Extensions of time granted, if any, will be converted to calendar days.

§ 1.1.10.3 Holidays

Owner approved holidays for Contractor's Work are limited to New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day.

§ 1.1.10.4 Work Day

Work days include all calendar days except Holidays, Saturdays and Sundays.

...

§ 1.2.1.2 During the course of the Work, should any conflict be found in or between the Contract Documents, the Contractor shall be deemed to have included in the cost of the Work the greater quantity or better quality, or the most stringent requirements, unless Contractor shall have obtained, before the submission of Contractor's Proposal, an interpretation in writing from the Architect as to what shall govern. The Architect, in case of such conflict, may interpret or construe the document so as to obtain the most substantial and complete performance of the Work consistent with the Contract Documents and reasonably inferable therefrom, in the best interests of Owner, and the Architect's interpretation shall be final. The terms and conditions of this clause shall not relieve any party of any other obligation under the Contract Documents.

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§ 1.2.4 Precedence Of The Contract Documents

The most recently issued Document takes precedence over previous issues of the same Document. The order of precedence is as follows with the highest authority listed as "1".

- .1 Contract Modifications signed by Contractor and Owner.
- .2 Addenda, with those of later date having precedence over those of earlier date.
- .3 General Conditions - AIA Document A201-2017, as modified by the Owner for the Project.
- .4 Specifications and Drawings.
- .5 Agreement – AIA Document A101-2017, as modified by the Owner for the Project.
- .6 Bid/Proposal Documents including the Project Manual, Contractor's Bid or Proposal Documents (to the extent such Bid or Proposal submitted by the Contractor is part of the Contract Documents and is not inconsistent with other portions of the Contract Documents)

§ 1.2.5 Relation Of Specifications And Drawings

Specifications and Drawings are to be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the better quality and greater quantity of Work indicated. In the event of the above-mentioned disagreements, the resolution shall be determined by the Architect.

§ 1.2.5.1 Drawings and Specifications are to be equivalent in authority and priority. Should they disagree in themselves, or with each other, prices shall be based on the better quality and greater quantity of Work indicated. In the event of the above-mentioned disagreements, the resolution shall be determined by the Architect.

§ 1.2.5.2 Where, in the Drawings and Specifications, certain products, manufacturer's trade names, or catalog numbers are given, it is done for the express purpose of establishing a standard of function, dimension, appearance, and quality of design, in harmony with the Work, and is not intended for the purpose of limiting competition. Materials or equipment shall not be substituted unless such substitution has been specifically accepted for use on this Project by the Architect.

§ 1.2.5.3 When the Work is governed by reference to standards, building codes, manufacturer's instructions, or other documents, unless otherwise specified, the current edition as of the Agreement date shall apply.

§ 1.2.5.4 Requirements of public authorities apply as minimum requirements only and do not supersede more stringent specified requirements.

Terms capitalized in these General Conditions include those that ~~are~~ are: (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

In the interest of ~~brevity~~, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

...

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered (whether actually received or not) when deposited with the United States Postal Service, postage prepaid, certified mail, return receipt requested, and addressed to the intended recipient at the address shown in this Agreement. Notice may also be given in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement. (e-mail or facsimile) or other commercially reasonable means and will under any of these circumstances, be effective when actually received. Any address for notice may be changed by written notice delivered as provided in this Section 1.6.

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The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, Exhibit or such other form agreed to by the parties, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

~~Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.~~ [Paragraph Deleted.]

...

§ 2.1.1 The Owner is the ~~person or entity identified as such in the Agreement~~ Board of Trustees of the Midlothian Independent School District and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. may designate in writing one or more persons to represent the Owner; however, such representatives shall have the authority to bind the Owner only to the extent expressly authorized by the Owner and shall have no implied authority. Except as otherwise provided in Section 4.2.1, the Architect does not have ~~such authority.~~ the authority to bind the Owner. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein may engage a third-party consultant to represent the Owner. The Owner will notify the Contractor of the identity of such consultant.

§ 2.1.3 The Contractor acknowledges that no lien rights exist with respect to public property.

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§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. ~~If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended~~

~~appropriately.~~ Pursuant to the requirements of Texas Business and Commerce Code section 56.054(e)(3), the Owner represents that funds are available and have been authorized for the full contract amount of the Work.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.~~[Paragraph Deleted.]~~

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.~~[Paragraph Deleted.]~~

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.~~[Paragraph Deleted.]~~

...

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to ~~whom the Contractor has no reasonable objection and~~ whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner ~~shall may~~ furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. ~~The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work site, but shall have no duty to do so.~~ Notwithstanding the foregoing, if the Owner provides such survey, the Contractor shall remain responsible to independently investigate the physical characteristics, legal limitations, and utility locations for the Project site. In the event that the Contractor damages any utilities during construction, the Contractor shall immediately repair the same at its sole cost and expense.

§ 2.3.5 The Owner shall furnish information ~~Information~~ or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services. ~~shall be furnished by the Owner within a reasonable time following actual receipt of a written request.~~

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. ~~The Contractor, Owner and Architect shall agree on an appropriate quantity of drawings and specifications to be printed and distributed for bidding purposes.~~ The drawings shall be provided by the Architect and paid for by the Owner.

§ 2.3.7 Owner's personnel or consultant may, but are not required to be present at the construction site during progress of the Work to assist the Architect in the performance of his duties, and to verify the Contractor's record of the number of workmen employed on the Work, their occupational classification, the time each is engaged in the Work, and the equipment used in the performance of the Work for purpose of verification of Contractor's Applications for Payment.

§ 2.3.8 The Owner (either directly or by contract with the Architect) may furnish tests, inspections, and reports, required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 2.3.9 The Owner, (directly or by contract with the Architect), when such services are required, in the professional opinion of the Architect, shall furnish services of geotechnical engineers, which may include test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

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If the Contractor fails to correct Work that is defective or not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly Section 12.2, fails to timely carry out Work in accordance with the Contract Documents, Documents or is in default of any of its material obligations hereunder, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.entity.. This right shall be in addition to, and not in restriction of, the Owner's right under Section 12.2.

...

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.5.1 If the Contractor is in default in any of its material obligations hereunder, neglects to timely carry out the Work in accordance with the Contract Documents, or fails to correct nonconforming or defective Work as required by Section 12.2, and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or such non-conforming or defective Work with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or such non-conforming or defective Work at the sole cost of the Contractor. The Architect may, pursuant to Section 9.5.1, withhold or nullify the Contractor's Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such default or such non-conforming or defective Work, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure to correct such non-conforming or defective Work. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

§ 2.5.2 Nothing contained in this Section 2.5 is intended to limit or modify any obligations under the law or under the Contract Documents, including any warranty obligations, expressed or implied.

...

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be authorized to do business in the state of Texas and lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative, or in the case of a Construction Manager-at-Risk, the Construction Manager-at-Risk, or its authorized representative.

§ 3.1.2 The Contractor shall perform the Work in a good and workmanlike manner and accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Owner or Owner's consultants, if applicable, conducted in accordance with the Contract Documents or activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. The Contractor and each Subcontractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including without limitation: (1) the location, condition, layout and nature of the Project site and surrounding areas, (2) generally prevailing climatic conditions, (3) anticipated labor supply and costs, (4) availability and cost of materials, tools and equipment, and (5) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site, or for price escalations in the marketplace. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any Subcontractor to comply with the requirements of this Section.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. Contractor shall not perform any Work it knows involves an error, inconsistency, or omission without further instructions to Contractor or revised Construction Documents from the Architect. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the Work installed by other contractors, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, and locations. In all cases of interconnection of its Work with existing or other Work, it shall verify at the site all dimensions relating to such existing or other Work. Any errors due to the Contractor's failure to so verify all such grades, elevations, dimensions, or locations shall be promptly rectified by the Contractor without any additional cost to the Owner.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If the Contractor has knowledge that any of the products or systems specified will perform in a manner that will limit the Contractor's ability to satisfactorily perform the Work or honor its warranty, or will result in a limitation of or interference with the Owner's intended use, then the Contractor shall promptly notify the Architect and Owner, in writing providing substantiation for its position.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15-15; however, nothing in this section shall provide the Contractor with an affirmative claim for damages for delay by Owner or Architect, as such a claim is prohibited under this Contract. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the

Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 Notwithstanding the delivery of a survey or other documents by the Owner, Contractor shall use reasonable efforts to perform all Work in such a manner so as to avoid damaging any utility lines, cables, pipes, or pipelines on the property. Contractor shall be responsible for, and shall repair at Contractor's own expense, any damage done to lines, cables, pipes, and pipelines identified to Contractor.

§ 3.2.6 The Owner and Contractor agree that the Contract Documents may not be free from errors, inconsistencies, or omissions, and further agree that the Owner makes no warranty as to the completeness or accuracy of the Contract Documents, either express or implied. Execution of the Contract by the Contractor is a representation that the Contractor has thoroughly reviewed and become familiar with the Contract Documents and that the Contractor is not aware of any errors, inconsistencies or omissions in the Contract Documents which would delay the Contractor in the performance of the Contract Work. The Contractor shall not be entitled to any damages or increase in the Contract Amount due to delays or disruptions to the Work. This limitation on damages is further subject to the limitations set forth in Section 15.1.7.

§ 3.2.7 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for the Architect to evaluate and respond to the Contractor's request for information, where such information was available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor prepared coordination drawings, or prior Project correspondence or documentation.

§ 3.2.8 The Contractor shall use the AIA Document G716-2004 "REQUEST FOR INFORMATION" (RFI) form unless otherwise provided in the Contract Documents. The Contractor shall keep a log of all RFI's submitted and number the RFI's consecutively beginning with the number 1.

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§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall assign a Superintendent who shall make decisions on behalf of the Contractor and its subcontractors. The Superintendent shall be on the Project, in this capacity, at all times while Work on the Project is in progress. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

...

§ 3.3.4 Contractor shall bear responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with Texas Government Code, Section 2166.303 and Texas Health and Safety Code, chapter C, Sections 756.021, *et seq.*, and shall require any applicable subcontractor to comply all such procedures. Trench excavation safety protection shall be a separate pay item, and shall be based on linear feet of trench excavated. Special shoring requirements shall also be a separate pay item, and shall be based on the square feet of shoring used.

§ 3.3.5 It is understood and agreed that the relationship of Contractor to Owner shall be that of an independent Contractor. Nothing contained herein or inferable herefrom shall be deemed or construed to (1) make Contractor the agent, servant, or employee of the Owner, or (2) create any partnership, joint venture, or other association between Owner and Contractor. Any direction or instruction by Owner in respect of the Work shall relate to the results the Owner desires to obtain from the Work, and shall in no way affect Contractor's independent contractor status as described herein.

§ 3.3.6 The Contractor shall review contractor safety programs, procedures, and precautions in connection with performance of the Work. However, the Contractor's duties shall not relieve any Subcontractor(s) or any other person

or entity (e.g. a supplier) including any person or entity with whom the Contractor does not have a contractual relationship, of their responsibility or liability relative to compliance with all applicable federal, state and local laws, rules, regulations, and ordinances which shall include the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. The foregoing notwithstanding, the requirements of this Section are not intended to impose upon the Contractor any additional obligations that the Contractor would not have under any applicable state or federal laws including, but not limited to, any rules, regulations, or statutes pertaining to the Occupational Safety and Health Administration.

§ 3.3.7 Contractor acknowledges that the Work may be performed in connection with an educational facility which is currently occupied and in use. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb, or disrupt Owner's normal operations or facilities. Contractor agrees to and shall comply with all rules, regulations and requirements of the Owner and the school campus on which the Work is to be performed, and shall take all steps necessary to protect and guard the safety of the employees, students and invitees of Owner. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. Contractor understands and accepts the difficulties and costs associated with working in an existing facility and the potential delays and disruptions in its Work and has included such items in the Contract Time and the Contract Sum. The Contractor shall perform all the Work in such a manner as to cause minimum interference with the operations of the Owner and other contractors and Subcontractors on the site, and shall take, and cause the Contractor's and its Subcontractor's employees, agents, licensees and permittees to take all necessary precautions to protect the Work and the site and all persons and property thereon from damage or injury.

§ 3.3.8 Representatives of the Owner, Contractor, and Architect shall meet periodically at mutually agreed upon intervals, for the purpose of establishing procedures to facilitate cooperation, communication, and timely responses among the participants. By participating in this arrangement, the parties do not intend to create additional contractual obligations or modify the legal relationships which may otherwise exist.

§ 3.3.9 The Contractor shall pay fees for public or private water, gas, electrical and other utility service at the site until Substantial Completion of the Work. In the event that the Work will be conducted at an Owner site, where utility services are existing on site and reasonably accessible to the Contractor, the Owner may elect, in writing, to provide and pay for utility service for the Project site. Agreement to pay for such utility service shall not absolve the Contractor from using utilities judiciously in connection with its performance of the Work. In all cases, the Contractor shall secure and arrange for all necessary utility connections.

§ 3.3.10 The Owner may require that the Contractor use and/or respond to certain Owner-furnished forms or inquiries during the course of the Project. From time to time, there may be future revisions, changes, additions or deletions to these forms. The fact that the Owner modifies and increases reasonable reporting requirements shall not serve as the basis for a claim for additional time or compensation by the Contractor.

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for qualified, careful, and efficient workers and labor, eligible to work in accordance with state and federal law. Contractor shall appropriately classify all workers in accordance with the Fair Labor Standards Act, its implementing regulations, and Texas Labor Code Section 214.008. In addition, unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Before ordering any material or doing any Work, Contractor shall verify all dimensions and check all conditions in order to assure Contractor that they are the same as those in the Drawings, Specifications, and other Construction Documents. Any inconsistency shall be brought to the attention of the Architect. In the event that discrepancies occur between ordered material and actual conditions and Architect was not notified beforehand, then costs to correct such discrepancies shall be borne by Contractor. In accordance with Texas Government Code §2269.054, these Contract Documents shall not be construed to deny or diminish the right of any person to work because of the person's membership or other relationship status with respect to any organization. In accordance with Texas Government Code §2269.0541, these Contract Documents shall also not prohibit, require, discourage or encourage a person, or discriminate against a

person bidding on this contract from entering into or declining to enter into, or adhering to, an agreement with a collective bargaining organization relating to this Project.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2 Prevailing Wages

§ 3.4.2.1 The Project is subject to the Texas Government Code, Chapter 2258, Prevailing Wage Rates. This statute requires the Contractor and any Subcontractor to pay not less than the prevailing rates of per diem wages in the locality at the time of construction to all laborers, workmen, and mechanics employed by them in the execution of the contract.

§ 3.4.2.2 In accordance therewith, the Owner has established a scale of prevailing wages which is incorporated in the Project specifications, and not less than this established scale must be paid on the Project. Any workers not included in the schedule shall be properly classified and paid not less than the rate of wages prevailing in the locality of the Work at the time of construction.

§ 3.4.2.3 A Contractor or Subcontractor who violates the provisions of Sections 3.4.1.1 or 3.4.1.2 shall pay to Owner the sum of Sixty Dollars and No/100 (\$60.00) for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rate stipulated in the scale of prevailing wages applicable to this Project, as required by Texas Government Code Section 2258.023(b).

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.**Substitutions**

§ 3.4.3.1 If the Contract Documents (including the Instructions to Proposers and/or Offerors) specifically permit the submission by Contractor of requests for substitutions, Contractor may, within thirty (30) days after the Contract has been executed, make written request for the substitution of products in place of those specified in the Contract Documents to the Owner and the Architect. Any request for substitution shall be submitted to the Architect in writing, with appropriate shop drawings, product data, and certified test results substantiating the proposed product equivalence as required by this Section 3.4.3.1 and Section 3.4.3.2 and will be rejected if not so submitted.

§ 3.4.3.2 The Contractor must submit to the Architect and the Owner (i) a full explanation of the proposed substitution and submittal of all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other information necessary for a complete evaluation of the substitution; (ii) a written explanation of the reasons the substitution is necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable; (iii) the adjustment, if any, in the Contract Sum; (iv) the adjustment, if any, in the time of completion of the Contract and any modifications to the construction schedule; and (v) an affidavit stating that (a) the proposed substitution confirms to and meets all the requirements of the pertinent Specifications and the requirements shown on the Drawings, (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect; (c) the cost breakdown presented with Contractor's request is complete and includes all related costs, except for the Architect's redesign costs, if any, and waives all claims for additional costs related to the substitution which subsequently become apparent; (d) that the Contractor will coordinate and supervise the installation of the proposed substitute, making such changes as may be required for the Work to be complete in all respects; and (e) the Contractor will reimburse the Owner and for review or redesign services associated with any re-approval by applicable governmental authorities related to the substitution.

§ 3.4.3.3 By making requests for substitutions pursuant to Section 3.4.3 (and all subsections), the Contractor represents and certifies that: (1) Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to the product specified; (2) Contractor will provide the same warranty for the substitution product that the Contractor would have provided for the product specified; (3) the cost breakdown presented with the request is complete and includes all related costs, except for the Architect's redesign costs, if any, and waives all claims for additional costs related to the substitution which subsequently become apparent; (4) Contractor will coordinate and supervise the installation of the proposed substitute, making such changes as may be required for the Work to be complete in all respects; and (5) will reimburse Owner and Architect for review or redesign services associated with any re-approval by applicable governmental authorities related to the substitution.

§ 3.4.3.4 Owner and the Architect may accept or reject any such request for substitution in their sole discretion, based on cost, time, or other considerations. Requests for substitutions submitted after such thirty (30) day period will not be considered unless a product becomes impossible to obtain due to circumstances beyond the Contractor's control.

§ 3.4.3.5 Regardless of acceptance or rejection of substitution, the Contractor shall be responsible for amounts paid by the Owner to the Architect, to evaluate the Contractor's proposed substitutions and any amounts paid to the Architect to make agreed upon changes in the Specifications and Drawings made necessary by the Owner's acceptance of such substitutions. The Owner shall be entitled to deduct such amounts from the Contract Sum.

§ 3.4.4 Responsibility for Subcontractors

§ 3.4.4.1 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. Contractor, its subcontractors and vendors shall bear responsibility for compliance with all federal, state and local laws, regulations, guidelines, and ordinances pertaining to worker safety and applicable to the Work. Contractor further recognizes that the Owner and Architect do not owe the Contractor any duty to supervise or direct his work so as to protect the Contractor from the consequences of his own conduct. THE CONTRACTOR RELEASES, INDEMNIFIES AND HOLDS HARMLESS THE OWNER FOR CONTRACTOR'S FORCES; NON-COMPLIANCE WITH OWNER'S DRUG-FREE, ALCOHOL-FREE, WEAPON-FREE, HARASSMENT-FREE, AND TOBACCO-FREE ZONES; CONTRACTOR'S FORCES NON-COMPLIANCE WITH CRIMINAL LAW; OR CONTRACTOR'S OR CONTRACTOR'S FORCES NON-COMPLIANCE WITH IMMIGRATION LAW OR REGULATIONS. Any individual found by Owner to have violated these restrictions is subject to permanent removal from the Project, at Owner's request. Contractor shall place similar language in its subcontract agreements, requiring its Subcontractors and Sub-subcontractors to be responsible for their own forces and Contractor shall cooperate with the Owner to ensure Subcontractor and Sub-subcontractor compliance.

§ 3.4.4.2 The Contractor shall only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall be responsible for the actions of Contractor's forces, Subcontractor's forces and all tiers of Sub-subcontractor's forces. The Contractor recognizes that the Work may be performed in connection with an operational educational facility or the Project site may be adjacent to a public-school campus. It is imperative that Contractor's operations and the performance of the Work not interfere with, interrupt, disturb or disrupt Owner's normal operations or facilities. Contractor shall exercise the utmost skill and judgment to ensure that continuing construction activity will not interfere with the use, occupancy and quiet enjoyment of facilities in use on the site. Contractor recognizes that the ongoing activities in proximity with its construction activities shall result in the need for prompt and effective coordination of its services with those involved in the ongoing utilization of the premises. Such coordination and adequate site access shall be the responsibility of Contractor. Contractor understands and accepts the difficulties and costs associated with working at or near an operational campus and the potential delays and disruptions in its Work and has included such items in the Contract Time and the Contract Sum.

§ 3.4.5 Criminal History Records Checks

§ 3.4.5.1 Unless otherwise exempt from providing such information by any provision in Texas Education Code, Section 22.08341 (the "Statute"), the Contractor agrees, that prior to commencement of work under this Agreement, using the form promulgated by the Owner or such other form approved by the Owner, Contractor will arrange with the Owner to obtain any national criminal history record information ("CHRI") required pursuant to Texas Education Code, Section 22.08341 (the "Statute") on all of Contractor's employees, independent contractors, agents, or Subcontractors, Contractor's Subcontractors of every tier ("Subcontractors"), Subcontractors' employees, independent contractors, agents, or sub-subcontractors, if any of these persons is a "Covered Employee" as defined by the Statute, i.e. the person has or will have continuing duties related to the contracted for services, and said person has or will have the opportunity for direct contact with students in connection with those continuing duties and shall reimburse the Owner for the costs and expenses associated with obtaining the criminal history information. For purposes of this Section 3.4.5 a person does not have the opportunity for direct contact with students if:

- .1 the public work does not involve the construction, alteration, or repair of an improvement to real property, or a necessary fixture of an improvement to real property that is used predominantly for teaching the curriculum required by the Texas Education Code ("Instructional Facility");

- .2 for a public work that involves construction of a new Instructional Facility, the person's duties related to the contracted services will be completed not later than the seventh (7th) day before the first date the facility will be used for instructional purposes; or
- .3 for a public work that involves an existing Instructional Facility:
 - (a) the public work area contains sanitary facilities and is separated from all areas used by students by a secure barrier fence that is not less than six feet in height; and
 - (b) the Contractor adopts a policy prohibiting employees, including subcontractor entity employees, from interacting with students or entering areas used by students, informs employees of the policy, and enforces the policy at the public work area.

§ 3.4.5.2 Any Covered Employee that has during the preceding thirty (30) years, been convicted of one of the following offenses, if at the time of the offense the victim was under eighteen (18) or enrolled in a public school: (a) a felony offense under Title 5, Texas Penal Code; (b) an offense for which a defendant is required to register as a sex offender under Chapter 62, Texas Code of Criminal Procedure; or (c) an equivalent offense to (a) or (b) under federal law or the laws of another state ("Disqualifying Criminal History") shall be disqualified and prohibited from performing any contract duties or services and neither the Contractor nor its Subcontractor may permit such person to provide services at an instructional facility. If a Covered Employee is determined by the Owner's review of the CHRI to have a Disqualifying Criminal History, Contractor will exclude that person from assignment to the Project. Contractor understands that it will not have access to the results of such criminal history records check, based on statewide regulations beyond the control of the Owner, and agrees to rely solely on the judgment of the Owner as to whether the Covered Employee must be excluded from the Project.

§ 3.4.5.3 Prior to commencement of its work on the Project the Contractor will provide written certification to the Owner that either: (1) Contractor and its Subcontractors of every tier, do not have any Covered Employees, as defined; (2) are otherwise exempt from compliance with the Statute; or (3) has complied with the statutory and contractual requirements stated in this Section 3.4.5 as of that date, and that it:

- .1 has requested a Criminal History Records Check through the District on all Covered Employees, if any, of every tier, has provided the required information to the District to do so and reimbursed the District for same;
- .2 has obtained written certification from its independent contractors, and Subconsultants (of any tier) that they have provided the required information to the Consultant, necessary to secure the information from the District and reimbursed the Consultant for same; and
- .3 have excluded any Covered Employee reported by the District to have a Disqualifying Criminal History from assignment to the Project.

Further, Consultant agrees that if it receives information that a Covered Employee is arrested or convicted for any of the Disqualifying Criminal History offenses, during the performance of the Work, Consultant will immediately remove the Covered Employee from District's property or other location where students are regularly present, and notify the District of said removal within three (3) days of doing so. Consultant understands that any failure to comply with the requirements of this section may be grounds for termination of this Agreement, in accordance with Article 14, Termination.

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§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. The Contractor further warrants that Contractor shall perform the Work in a good and workmanlike manner, continuously and diligently in accordance with all applicable codes, generally accepted standards of construction practice for construction of projects similar to the Project. All materials shall be installed in a true and straight alignment, level and plumb; patterns shall be uniform; and jointing of materials shall be flush and level, unless otherwise directed in writing by the Architect. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. No acceptance or payment by the Owner shall constitute a waiver of the foregoing and nothing herein shall exclude or limit any warranties implied by law. The warranties provided in this Section 3.5.1 are in addition to, and not

in limitation of, any other warranties, remedies and/or guaranties set out in the Contract Documents or under applicable law.

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§ 3.5.3 Contractor acknowledges that the Project may involve construction work on more than one (1) building for the Owner. In such case, each building, or approved phase of each building, may have its own, separate, and independent date of Substantial Completion (or, for Work to be completed or corrected after the date of Substantial Completion, the Warranty Commencement Date). Contractor shall maintain a complete and accurate schedule of the date(s) of Substantial Completion, the date(s) of Final Completion, and the dates upon which the warranties under granted in the Contract Documents will expire, on each phase or building and will provide a copy of such Schedule to the Owner, as required in Subsection 3.5.6, as a condition precedent to Final Payment.

§ 3.5.4 When deemed necessary by the Owner and prior to installation of any item specifically made subject to a performance standard or regulatory agency standard under any provision of the Contract Documents, Contractor shall furnish proof of conformance to the Architect. Proof of conformance shall be in the form of an affidavit from the manufacturer certifying that the item is in conformance with the applicable standards; an affidavit from a testing laboratory certifying that the product has been tested within the past year and is in conformance with the applicable standards; or such further reasonable proof as is required by the Architect.

§ 3.5.5 The Contractor agrees to assign to the Owner at the time of Final Completion of the Work any and all manufacturer's warranties relating to equipment, machinery, materials, equipment or components and labor incorporated into the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturer's warranties. Contractor shall take no action or fail to act in any way which results in the termination or expiration of such third-party warranties or which otherwise results in prejudice to the rights of Owner under such warranties. Contractor agrees to provide all notices required for the effectiveness of such warranties and shall include provisions in the contracts with the providers and manufacturers of such systems and equipment whereby Owner shall have a direct right, but not a duty, of enforcement of such warranty obligations. The warranties provided in this Section 3.5 or otherwise provided in the Contract Documents or by law, shall in no way limit or abridge the warranties provided by the suppliers of equipment and systems which are to comprise a portion of the Work. A complete set of all warranties required from contractors, manufacturers, or suppliers as appropriate, on the manufacturer's or supplier's approved forms, executed by Contractor as required, with a Warranty Commencement Date noted as required, and in the form required by Subparagraph 3.5.6 shall be submitted to the Architect for delivery to the Owner, as a condition precedent to Final Payment.

§ 3.5.6 Prior to receipt of Final Payment, Contractor shall: (1) obtain duplicate original warranties, executed by all subcontractors, and the warranties of suppliers and manufacturers, noting the Warranty Commencement Date on the face of each; (2) verify that the documents are in proper form and contain full information; (3) Co-sign warranties when required; (4) bind all warranties in commercial quality 8-1/2 X 11 inch three-ring binder, with hardback, cleanable, plastic covers; (5) label the cover of each binder with a typed or printed title labeled "WARRANTIES", along with the Title of the Project; name, address and telephone number of Contractor; and name of its responsible principal; (6) include a Table of Contents, with each item identified by the number and title of the specification section under which the product is specified; (7) include the Schedule of Warranty Commencement Dates required by Subparagraph 3.5.3; (8) separate each warranty with index tab sheets keyed to the Table of Contents listing; and (8) deliver warranties in the form described in this Subparagraph 3.5.6, to the Architect for review same prior to submission to the Owner.

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect not include in the Contract Price or any Modification any amount for sales, use, or similar taxes for which (1) a Texas independent school district is exempt, and (2) the Owner has provided the Contractor with a tax exemption certificate or other documentation necessary to establish the Owner's exemption from such taxes.

CONTRACTOR HEREBY RELEASES, INDEMNIFIES, AND HOLDS HARMLESS OWNER FROM ANY AND ALL CLAIMS AND DEMANDS MADE AS A RESULT OF THE FAILURE OF CONTRACTOR OR ANY SUBCONTRACTOR TO COMPLY WITH THE PROVISIONS OF ANY OR ALL SUCH LAWS AND REGULATIONS.

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§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper

execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. proposals are received or negotiations concluded. The Owner shall be responsible for payment of TDLR Texas Accessibility submissions and inspection costs.

§ 3.7.2 ~~The In performing its obligations hereunder, the Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.~~ Work and upon request by the Owner or Architect shall furnish evidence, satisfactory to the Owner, of such compliance.

§ 3.7.3 If the Contractor performs Work ~~knowing when Contractor knows or reasonably should have known it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, the Contract Documents, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.~~ **THE CONTRACTOR AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS THE OWNER, ITS TRUSTEES, OFFICERS, REPRESENTATIVES, AGENTS AND EMPLOYEES FROM AND AGAINST ALL THIRD-PARTY CLAIMS, FINES, PENALTIES, OR LIABILITIES FROM, ARISING OUT OF, OR BASED UPON CONTRACTOR'S VIOLATION OF ANY LAWS, ORDINANCES, RULES, REGULATIONS, ORDERS OR DECREES.**

§ 3.7.4 Concealed or Unknown Conditions

~~If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.~~

§ 3.7.4 Claims for Concealed or Unknown Conditions

Contractor acknowledges that there may exist at the Project site certain soil and geological conditions and/or surface physical conditions which are not disclosed in the Contract Documents, and which have been known to or may be reasonably anticipated to occur in the area or be related to any past use of the Project site, including, without limitation, the presence of rock and its hardness, geologic formations, differing soils, and surface structures, equipment or other impediments, either natural or man-made (collectively, "Subsurface Conditions"). Owner makes no representations or warranties regarding Subsurface Conditions at the Project site, or of the accuracy or continuity of conditions which may be noted in any reports furnished or made available to Contractor. Contractor covenants and agrees that any such reports are furnished or made available by Owner to Contractor for information purposes only, and Contractor acknowledges that Owner is not responsible for the content thereof. Contractor shall be responsible for inspecting the site and determining the existence or likelihood of any Subsurface Conditions which may affect the Contract Time or the Contract Sum, or both. The Contract Time and the Contract Sum contained herein (as proposed by Contractor), or GMP as applicable, shall be deemed to include all costs of and sufficient time to complete all Work associated with or attributable to Subsurface Conditions, and Contractor shall not be entitled to submit a claim for or to obtain an extension of the Contract Time or increase in the Contract Sum due to the existence of Subsurface Conditions. Except as provided above with respect to Subsurface Conditions, if the Contractor encounters conditions at the site that are subsurface or otherwise concealed physical conditions which were not known to the Contractor, and that differ materially from those indicated in the Contract Documents the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed, and in no event later than three (3) days after first observance of the conditions and report its findings to the Owner and Architect.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall

continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15. In accordance with the terms of this Agreement, there will be no adjustment to the Contract Sum for delay arising out or related to the circumstances described in this Section 3.7.5.

§ 3.7.6 The Contractor shall also obtain all permits and approvals, and pay all fees and expenses, if any, associated with National Pollutant Discharge Elimination System (NPDES) regulations administered by the Environmental Protection Agency (EPA) and local authorities, if applicable, that require completion of documentation and/or acquisition of a "Land Disturbing Activities Permit" for the Project. Contractor's obligations under this Section do not require it to perform engineering services during the pre-construction phase to prepare proper drainage for the construction sites. However, any drainage alterations made by Contractor during the construction process which require the issuance of a permit shall be at Contractor's sole cost.

§ 3.7.7 The Contractor shall certify in writing that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by Local/State standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The Contractor shall provide this written certification as part of submittals under the Section in the Instruments of Service related to Contract Closeout.

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§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness within such time as is reasonably specified by the Contractor as necessary to avoid delay in the Work.

§ 3.8.4 When performing Work under Allowances, where reasonably possible, Contractor shall solicit and receive no fewer than three (3) written proposals and shall provide the Work on the basis of the best value for the Owner, as directed by the Architect following Owner's written approval of the cost proposal.

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§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor shall not replace the Superintendent prior to Final Completion of the Work unless (1) the Superintendent shall cease to be employed by the Contractor or its subsidiaries or affiliated companies, or (2) the Owner agrees to such replacement. The Superintendent may not be employed on any other project prior to Final Completion of the Work. From Substantial Completion to Final Completion, the Superintendent shall be on-site as necessary to ensure that Final Completion occurs within thirty (30) days of Substantial Completion.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection. furnish a list to the Architect a list of all engineers, consultants, job-site superintendents, subcontractors and suppliers involved in construction. The Architect shall provide such information to the Owner. The Owner shall have the right, at any time, to require a change in any engineer, consultant, job-site superintendent, subcontractor or supplier if their performance is deemed unsatisfactory in its sole discretion.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed, provide an adequate staff for the proper coordination and expedition of the Work. Owner reserves the right to require Contractor to dismiss from the Work any employee or employees that Owner may deem incompetent, careless, insubordinate, or in violation of any provision in these Contract Documents. This provision is applicable to Subcontractors, Sub-subcontractors and their employees.

§ 3.9.4 Owner shall be notified as soon as Contractor becomes aware, but in no event fewer than twenty-four (24) hours before the time of that the Superintendent is required to be present at the site, that the Superintendent will not be

present at the site for any reason, except illness. If the reason is due to illness, then Owner shall be notified as soon as the Contractor obtains the information, but in no event later than the beginning of the day that the Superintendent will be absent from the site. In such event of such absence, the Contractor will designate a person as acting superintendent and Contractor promptly notify the Owner of the identity and contact information for the designated acting superintendent.

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§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. Work, utilizing critical path method scheduling techniques. The Schedule shall not exceed the time limits set forth in the Contract Documents. The Schedule shall thereafter be updated on a monthly basis and submitted with each Application For Payment. The receipt of an updated schedule with each Application For Payment shall be a condition precedent to the Owner's duty to make any payment pursuant to Article 9.6. The schedule shall not interfere with the operation of Owner's existing facilities and operations without Owner's prior written approval.

§ 3.10.1.1 Each Schedule shall: (1) break the work into a sufficient number of activities to facilitate the efficient use of critical path method scheduling by the Contractor, Owner, and Architect and shall assign each scheduled activity a cost value consistent with the Schedule of Values so as to allow the Owner and Contractor to project cash flow for the Project; (2) include activities representing manufacturing, fabrication, or ordering lead time for materials, equipment or other items for which the Architect is required to review submittals, shop drawings, product data, or samples; (3) with the exception of the initial schedule, shall indicate the activities, or portions thereof, which have been completed; (4) shall reflect the actual time for completion of such activities, and shall reflect any changes to the sequence or planned duration of all activities.

§ 3.10.1.2 If any updated Schedule exceeds the time limits set forth in the Contract Documents for completion of the Work, the Contractor shall include with the updated Schedule, a statement of the reasons for the anticipated delay in completion of the Work and the Contractor's planned course of action for completing the Work within the time limits set forth in the Contract Documents. If the Contractor asserts that the failure of the Owner or the Architect to provide information to the Contractor is the reason for anticipated delay in completion, the Contractor shall also specify what information is required from the Owner or Architect and documentation of the date such information was requested.

§ 3.10.1.3 Neither the Owner or the Contractor shall have exclusive ownership of float time in the schedule, and all float time shall inure to the benefit of the Project. The Contractor agrees to use its best efforts not to sequence the Work or assign activity durations so as to produce a schedule in which more than one-fourth of the remaining activities have no float time.

§ 3.10.1.4 Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents. If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. Submission of any schedule under this Contract constitutes a representation by the Contractor that: (1) the schedule represents the sequence in which the Contractor intends to prosecute the remaining Work; (2) the schedule represents the actual sequence and durations used to prosecute the completed Work; (3) that to the best of its knowledge and belief the Contractor is able to complete the remaining Work in the sequence and time indicated; and, (4) that the Contractor intends to complete the remaining Work in the sequence and time indicated.

§ 3.10.1.5 The Contractor shall recommend to the Owner and to the Architect a schedule for procurement of long-lead time items which will constitute part of the Work as required to meet the Project schedule. If such long-lead time items are procured by the Owner, they shall be procured on terms and conditions as recommended by the Contractor. Upon the Owner's acceptance of the Contractor's Stipulated Sum proposal or Guaranteed Maximum Price, as applicable, all contracts previously entered into by Owner shall be assigned by Owner to the Contractor who shall accept responsibility for such contracts as if it had initially entered into such contracts. Contractor shall expedite the delivery of long-lead time items. The Contractor shall receive and protect all Owner supplied material.

§ 3.10.1.6 The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions.

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§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect. Architect and shall attend progress meetings at the Project Site, in such frequency as are acceptable to the Owner. Progress of the work shall be reported at said meetings with reference to Contractor's construction schedule.

§ 3.10.4 The Contractor shall submit to the Architect with each monthly application for payment a copy of the progress schedule showing all modifications required, and shall take whatever corrective action is necessary to assure that the project completion schedule is met at no additional cost to Owner, except as allowed herein.

§ 3.10.4 Correction of Delay.

§ 3.10.4.1 In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, or any Milestone Date unless any such adjustment is submitted by the Contractor as a Claim in compliance with Article 15 or the adjustment is otherwise agreed to in a written confirmation from the Owner and documented by written Change Order.

§ 3.10.4.2 If at any time the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitations, (i) working additional shifts of overtime, (ii) supplying additional manpower, equipment and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule. The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner under or pursuant to this Subparagraph 3.10.4. The Owner may exercise the rights furnished the Owner under or pursuant to this Subparagraph 3.10.4 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

§ 3.10.4.3 In the event Contractor determines that the Scheduled Completion Date cannot be met by resequencing the Work, then Contractor shall immediately provide to the Owner, and in any event within seven (7) days after the date of receipt of any request by Owner for resequencing or acceleration, a plan to complete the Work in the shortest possible time. No approval by the Owner of any plan for resequencing or acceleration of the Work submitted by Contractor pursuant to this paragraph shall constitute a waiver by Owner of any damages or losses which Owner may suffer by reason of such resequencing or the failure of Contractor to meet the Scheduled Completion Date.

...

The Contractor shall maintain and make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, field test records (including environmental inspection and test records), inspection certificates or records, manufacturers' certificates. The Documents to be maintained shall be kept in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, Owner or their respective representatives, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review

by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

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§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. Specific dimensions, quantities, installation and performance of equipment and systems in compliance with the Construction Documents and the Contract Documents remain the Contractor's responsibility.

...

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect Architect, in writing, of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

...

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall ~~be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents.~~ The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Contractor represents and warrants that all shop drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the shop drawings are prepared and, if required by the Architect or applicable law, by a licensed engineer. The Owner and the Architect shall be entitled to rely upon the ~~adequacy~~ adequacy, completeness and accuracy of the services, certifications, and approvals performed or provided by such design professionals, ~~provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy.~~ Pursuant to this Section 3.12.10, professionals. Pursuant to this Section 3.12.10.1, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. A registered architect must prepare plans and specifications for all the Work, as governed by the Texas Occupations Code Chapter 1051; and a registered engineer must prepare plans, specifications and estimates for all Work governed by Texas Occupations Code Chapter 1001. In the event that Contractor retains a licensed design professional under the terms of this paragraph, Contractor shall require that the licensed design professional carry commercial general liability and errors and omissions insurance coverage in the same amounts and forms as required of the Architect on this Project. In the event that the licensed design professional retained by the Contractor will be conducting on-site services or observations, the licensed design professional shall also carry worker's compensation insurance and comprehensive automobile liability in the same amounts and forms as required of the Architect on this Project.

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§ 3.12.10.3 The Architect's review of Contractor's submittals will be limited to one examination of an initial submittal and one (1) examination of a resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals.

~~The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.~~ § 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. The Contractor shall so conduct its operations as not to unreasonably interfere with traffic on public thoroughfares adjacent or near to the Project site.

§ 3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction material and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

§ 3.13.3 Without prior approval of the Owner, the Contractor shall not permit any workers to use any of Owner's existing facilities at or adjacent to the Project site, including, without limitation, lavatories, toilets, entrance and parking areas other than those designated by the Owner. The Contractor shall comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site and District's Buildings.

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§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly, provided, however, that any such cutting, fitting or patching can only be performed if the cutting, fitting or patching results in Work that is in accordance with the Contract Documents. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

...

§ 3.15.1 The Contractor shall, on a daily basis, keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. Contractor shall provide on-site containers for the collection of waste materials, debris and rubbish, and shall periodically remove waste materials, debris and rubbish from the Work and dispose of all such materials at legal disposal areas away from the site. All cleaning operations shall be scheduled so as to ensure that contaminants resulting from the cleaning process will not fall on newly-coated or newly-painted surfaces. Immediately after unpacking materials, all packing case lumber or other packing materials, wrapping or other like flammable waste shall be collected and removed from the building and premises. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project. Prior to the Architect's inspection for Substantial Completion, the Contractor shall clean exterior and interior surfaces exposed to view; remove temporary labels, stains, putty, soil, paint and foreign substances from all surfaces, including glass and painted surfaces; polish transparent and glossy surfaces; clean equipment and fixtures to a sanitary condition; replace air filters in mechanical equipment; clean roofs, gutters, and downspouts; remove obstructions and flush debris from drainage systems; clean site; sweep paved areas and rake clean other surfaces; remove trash and surplus materials from the site; clean and polish all floors; clean and polish all hardware; and repair all Work damaged during cleaning and replace any damaged or broken glass.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor. Such reimbursement amounts may be deducted from Contractor's Final Payment Application.

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~~The Contractor shall provide the Owner and Architect~~ Owner, Architect and their designated representatives, with access to the Work in preparation and progress wherever located. The presence of the Owner, Architect or their

representatives does not constitute acceptance or approval of the Work. Upon request of the Architect or Owner, the Contractor shall accompany the Architect or Owner on an inspection of the Work.

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The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect. THE CONTRACTOR SHALL PAY ALL ROYALTIES AND LICENSE FEES. TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE OWNER, THE OWNER'S TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES DEFEND AGAINST ANY AND ALL SUITS, CLAIMS, LAWSUITS, JUDGMENTS, COSTS, LIENS, LOSSES, EXPENSES, FEES (INCLUDING REASONABLE ATTORNEY'S FEES, AS PERMITTED BY STATUTE), PROCEEDINGS, ACTIONS, DEMANDS, CAUSES OF ACTION, LIABILITY FOR INFRINGEMENT OF COPYRIGHTS AND PATENT RIGHTS ALLEGED TO HAVE RESULTED FROM CONTRACTOR'S INFRINGEMENT, AND SHALL INDEMNIFY AND HOLD THE OWNER THE OWNER'S TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM LOSS ON ACCOUNT THEREOF, INCLUDING ATTORNEY'S FEES (AS PERMITTED BY STATUTE), BUT SHALL NOT BE RESPONSIBLE FOR DEFENSE OR LOSS WHEN A PARTICULAR DESIGN, PROCESS, OR PRODUCT OF A PARTICULAR MANUFACTURER OR MANUFACTURERS IS REQUIRED BY THE CONTRACT DOCUMENTS, OR WHERE THE COPYRIGHT VIOLATIONS ARE CONTAINED IN DRAWINGS, SPECIFICATIONS, OR OTHER DOCUMENTS PROVIDED BY THE OWNER OR PREPARED BY THE ARCHITECT. HOWEVER, IF AN INFRINGEMENT OF A COPYRIGHT OR PATENT ATTRIBUTABLE TO THE OWNER OR ARCHITECT, IS DISCOVERED BY, OR MADE KNOWN TO, THE CONTRACTOR, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOSS UNLESS THE INFORMATION IS PROMPTLY FURNISHED TO THE OWNER AND THE ARCHITECT.

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§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18. TO THE FULLEST EXTENT PERMITTED BY LAW, THE CONTRACTOR SHALL INDEMNIFY, DEFEND (EXCEPT AS LIMITED BELOW) AND HOLD HARMLESS THE OWNER, THE OWNER'S TRUSTEES, OFFICERS, AGENTS AND EMPLOYEES (HEREINAFTER IN THIS SECTION 3.18 "OWNER"), FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, (INCLUDING BUT NOT LIMITED TO REASONABLE ATTORNEY'S FEES, AS PERMITTED BY STATUTE), ARISING OUT OF OR RESULTING FROM PERFORMANCE OF THE WORK, PROVIDED THAT SUCH CLAIM, DAMAGE, LOSS, OR EXPENSE IS ATTRIBUTABLE TO BODILY INJURY, SICKNESS, DISEASE OR DEATH, OR TO INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY (OTHER THAN THE WORK ITSELF), INCLUDING THE LOSS OF USE RESULTING THEREFROM, CAUSED IN WHOLE OR IN PART BY THE WILLFUL, INTENTIONAL OR NEGLIGENT ACTS OR OMISSIONS OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THE CONTRACTOR, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS, OR EXPENSE IS CAUSED IN PART BY THE OWNER. IF THE OWNER'S NEGLIGENCE IS A CONCURRENT CAUSE OF THE INJURY, DEATH, OR DAMAGE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT

(JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER AND CONTRACTOR ARE BOTH PARTIES. SUCH OBLIGATION SHALL NOT BE CONSTRUED TO NEGATE, ABRIDGE, OR REDUCE OTHER RIGHTS OR OBLIGATIONS OF INDEMNITY THAT WOULD OTHERWISE EXIST AS TO A PARTY OR PERSON DESCRIBED IN THIS SECTION 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts. IN CLAIMS AGAINST ANY PERSON OR ENTITY INDEMNIFIED UNDER THIS SECTION 3.18 BY AN EMPLOYEE OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THEM, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, THE INDEMNIFICATION OBLIGATION UNDER SECTION 3.18.1 SHALL NOT BE LIMITED BY A LIMITATION ON AMOUNT OR TYPE OF DAMAGES, COMPENSATION, OR BENEFITS PAYABLE BY OR FOR THE CONTRACTOR OR A SUBCONTRACTOR UNDER INSURANCE POLICIES, WORKERS' COMPENSATION ACTS, DISABILITY BENEFIT ACTS, OR OTHER EMPLOYEE BENEFIT ACTS.

§ 3.18.4 THE DUTY TO DEFEND SET OUT ABOVE SHALL NOT APPLY IN THE EVENT THAT THE CLAIM IS BASED, IN WHOLE OR IN PART, ON THE NEGLIGENCE OF, FAULT OF, OR BREACH OF CONTRACT BY THE OWNER. NOTWITHSTANDING THE FOREGOING, THE CONTRACTOR AGREES TO REIMBURSE THE OWNER'S REASONABLE ATTORNEY'S FEES IN PROPORTION TO THE CONTRACTOR'S LIABILITY.

§ 3.18.5 CONTRACTOR SHALL BE RESPONSIBLE FOR AND SHALL HOLD OWNER FREE AND HARMLESS FROM LIABILITY RESULTING FROM LOSS OF OR DAMAGE TO CONTRACTOR'S OR ITS SUBCONTRACTORS' CONSTRUCTION TOOLS AND EQUIPMENT AND RENTED ITEMS WHICH ARE USED OR INTENDED FOR USE IN PERFORMING THE WORK, REGARDLESS OF WHETHER SUCH LOSS OR DAMAGE IS CAUSED IN WHOLE OR IN PART BY THE WILLFUL, INTENTIONAL OR NEGLIGENT ACTS OR OMISSIONS OF THE CONTRACTOR, A SUBCONTRACTOR, ANYONE DIRECTLY OR INDIRECTLY EMPLOYED BY THE CONTRACTOR, OR ANYONE FOR WHOSE ACTS THEY MAY BE LIABLE, REGARDLESS OF WHETHER OR NOT SUCH CLAIM, DAMAGE, LOSS, OR EXPENSE IS CAUSED IN PART BY THE OWNER. IF THE OWNER'S NEGLIGENCE IS A CONCURRENT CAUSE OF THE INJURY, DEATH, OR DAMAGE, CONTRACTOR'S OBLIGATION TO INDEMNIFY IS LIMITED TO THE AMOUNT NECESSARY TO CAUSE THE RELATIVE LIABILITY OF OWNER AND CONTRACTOR TO REFLECT THE COMPARATIVE NEGLIGENCE FINDINGS OF THE TRIER OF FACT (JUDGE OR JURY) OR AS AGREED IN A SETTLEMENT AGREEMENT TO WHICH OWNER AND CONTRACTOR ARE BOTH PARTIES. THIS PROVISION SHALL APPLY, WITHOUT LIMITATION, TO LOSS OR DAMAGE OCCURRING AT THE WORK SITE OR WHILE SUCH ITEMS ARE IN TRANSIT TO OR FROM THE WORK SITE AND IS IN ADDITION TO CONTRACTOR'S OBLIGATIONS UNDER SECTION 3.18.1.

§ 3.18.6 The indemnification hereunder shall include, without limiting the generality of the foregoing, liability which could arise to the Owner pursuant to State statutes for the safety of workmen and in addition, all Federal statutes and rules existing thereunder for protection, occupational safety and health to workmen. It being agreed that the primary obligation of the Contractor is to comply with said statutes in performance of the Work by Contractor and that the obligations of the Owner under said statutes are secondary to that of the Contractor.

§ 3.18.7 It is agreed with respect to any legal limitations now or hereafter in effect and affecting the validity or enforceability of the indemnification obligations under Section 3.18, such legal limitations are made a part of the indemnification obligation and shall operate to amend the indemnification obligation to the minimum extent necessary to bring the provision into conformity with the requirements of such limitations, and as so modified, the indemnification obligations shall continue in full force and effect.

§ 3.18.8 Contractor shall promptly advise the Owner, in writing, of any claim or demand against the Owner or Contractor, known to the Contractor related to or arising out of Contractor's activities under this Contract.

§ 3.18.9 The provisions in Section 3.18 in its entirety shall survive the completion, termination or expiration of this

contract and are solely for the benefit of the parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

§ 3.19 Representations And Warranties

§ 3.19.1 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute this Contract, which representations and warranties shall survive the execution and delivery of the Contract and the Final Completion of the Work:

- .1 that it is financially solvent, able to pay its debts as they mature and possessed of sufficient working capital to complete the Work and perform its obligations under the Contract Documents;
- .2 that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;
- .3 that it is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental and public quasi-public authorities having jurisdiction over it and over the Work and the site of the Project;
- .4 that the execution of the Contract and its performance thereof is within its duly authorized powers; and
- .5 that its duly authorized representative has visited the site of the Work, familiarized itself with the local conditions under which the Work is to be performed and correlated its observations with the requirements of the Contract Documents.

§ 3.20 Business Standards

§ 3.20.1 Contractor, in performing its obligations under Contract, shall establish and maintain appropriate business standards, procedures, and controls, including those necessary to avoid any real or apparent impropriety or adverse impact on the interest of Owner or affiliates. Contractor shall review, with Owner, at a reasonable frequency during the performance of the Work hereunder, such business standards and procedures including, without limitation, those related to the activities of Contractor's employees and agents in their relations with Owner's employees, agents, and representatives, vendors, Subcontractors, and other third parties, and those relating to the placement and administration of purchase orders and contracts.

§ 3.21 Antitrust Violation

To permit the Owner to recover damages suffered in antitrust violations, Contractor hereby assigns to Owner any and all claims for overcharges associated with this Contract which violate the antitrust laws of the United States, 15 U.S.C.A. Section 1 et seq. The Contractor shall include this provision in its agreements with each subcontractor and supplier. Each subcontractor shall include such provisions in agreements with sub-subcontractors and suppliers.

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§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, ~~Contractor, and Architect.~~ Consent shall not be unreasonably withheld.

...

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date ~~the Architect issues the final Certificate for Payment of~~ the Owner's contract with the Architect terminates. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract ~~Documents.~~ Documents, or as they may be amended in the future.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract ~~Documents.~~ Documents. However, ~~the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.~~ Documents, and delivered on time. In addition, the Architect or its structural consultant will (1) provide on-site observations prior to and during all concrete pours that contribute to the structural integrity of the building, including all pours of concrete piers, footings, grade beams, floor slabs, and

concrete superstructure components, if applicable; and (2) provide on-site observations prior to covering up or closing up of portions of the construction which, if covered, would conceal problems with the structural integrity of the Project. Contractor shall not close or cover said Work until said observations have occurred. Contractor or Architect will advise Owner of the need for any third-party laboratory or testing services to assist the Architect and Owner.

§ 4.2.3 On the basis of the site ~~visits, observations,~~ the Architect will keep the Owner ~~reasonably~~ informed about the progress and quality of the ~~portion of the Work completed, and~~ Work. The Architect shall promptly report to the Owner and Contractor orally regarding: (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. An oral notification of defects and deficiencies observed in the Work shall be followed by a notice in writing to the Owner and Contractor specifying the defect(s), non-conforming Work, deviations from the Contract Documents and corrective actions taken or recommended. The Architect shall not have control over or responsibility for the Contractor's construction means, methods, techniques, sequences, procedures, or safety programs and will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. ~~The Architect will not~~ Documents, nor shall the Architect have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions ~~of the Work.~~ of the Work. This does not, however, relieve Architect of Architect's responsibilities under this Agreement. Any services by Contractor made necessary by Contractor's construction defect or nonconforming Work shall be performed by the Contractor at no additional cost to Owner. In addition, the Contractor shall reimburse the Owner for compensation paid to the Architect (whether performed by the Architect or its Consultants) or the Owner's Consultants, for additional site visits made necessary by the fault, neglect, the request of the Contractor or made necessary by the Contractor's construction defect or nonconforming Work. Any amount subject to reimbursement under this Section may be required by Owner to be deducted from the next Payment Application submitted by the Contractor and any subsequent Payment Application until paid, and if any amount remains unpaid, the balance shall be paid by the Contractor as a condition to Final Payment.

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The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters relating to the Contract and the Project. However, the Owner reserves the right to communicate directly with the Contractor and Subcontractors. Communication by and with the Architect's consultants shall be through the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. ~~The Contract Documents may specify other communication protocols.~~

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, in accordance with the Contract Documents, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect or the Owner has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect or the Owner considers it necessary or advisable, the Architect or the Owner will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect or the Owner nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Owner to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work. Certain portions of the Work may be tested and/or observed at various stages, sometimes off the Project site, between initial observation or review and final positioning of the completed Work. Nothing in any initial or prior approval or test result shall prevent action to require conformance, if at any subsequent time the Work or any portion thereof is found not to conform to the requirements of the Contract Documents. Architect and/or Contractor shall promptly notify, the other party orally and in writing, and Owner of any perceived fault or defect in the design or nonconformance of the Work with the Construction Documents they may respectively discover and each, upon discovery of the defect or nonconformance, shall be responsible for notifying the other party and Owner of those corrective actions they respectively take; provided, however, Contractor shall have no duty to notify Owner of discoveries made or actions taken by Architect.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing as to cause no delay in the Work or in the activities of the Owner, Contractor or Separate Contractors, and allow sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. If any submittal does not comply with the requirements of the Contract Documents, the Architect shall require Contractor to come into compliance. The Architect shall promptly report in writing to the Contractor and Owner any errors, inconsistencies and omissions discovered by the Architect in the Shop Drawings, Product Data and Samples, so as to keep from delaying the Work or the activities of the Owner, Contractor or other Contractors.

§ 4.2.8 The Architect will ~~prepare Change Orders and Construction Change Directives, and prepare, and make written recommendations to Owner regarding all Change Orders (including changes in the Work to be paid from contingency funds) and Construction Change Directives, for the Owner's approval and execution in accordance with the Contract Documents. The Architect's recommendation shall be accompanied by all supporting documentation necessary for the Owner to make an informed decision, including but not limited to an itemized turn-key proposal from the Contractor which includes quantities and unit costs of labor and materials extended and totaled and, if permitted, overhead and profit proposed. Prior to submission of such documentation to the Owner, the Architect shall review such proposals for reasonableness of pricing and compliance with Section 7.1.4 regarding markup. The Architect may order minor changes in the Work not involving an adjustment in Contract Sum or Guaranteed Maximum Price, or an extension of the Contract Time which are consistent with the intent of the Contract Documents. If necessary, the Architect shall prepare, reproduce and distribute Drawings and Specifications to describe Work to be added, deleted or modified, as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4. The Architect is specifically not authorized to approve changes involving major systems such as: Heating, Ventilation and Air Conditioning ("HVAC"); roof; foundation; outward appearance; color schemes; floor plans; building materials; drainage or mechanical equipment without Owner's prior written consent.~~

§ 4.2.9 The Architect ~~and the Owner's representative will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; completion. Upon completion of such inspection and agreement by Owner and Architect as to Substantial Completion, the Architect may issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.~~ Section 9.10 for approval by the Owner.

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§ 4.2.11 ~~The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. Upon written request of the Owner or Contractor, the Architect will issue its interpretation of the requirements of the plans and specifications. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.~~

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. ~~When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.~~

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents. ~~Documents and not expressly overruled in writing by the Owner.~~

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for ~~information~~information at no additional expense to the Owner.

§ 4.2.15 The Architect may appoint an employee or other person to assist the Architect during the construction. These representatives will be instructed to assist the Contractor in interpreting the Contract Documents; however, such assistance shall not relieve the Contractor from any responsibility as set forth by the Contract Documents. The fact that the Architect's Representative may have allowed Work not in accordance with the Contract Documents shall not prevent the Architect from insisting that the faulty Work be corrected to conform to the Contract Documents and the Contractor shall correct same.

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§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and ~~Architect~~Architect, in writing, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect ~~may~~shall notify the Contractor in writing, whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection. A notice of no reasonable objection shall in no way relieve the Contractor from full responsibility for performance and completion of the Work and its obligations under the Contract Documents. The Contractor shall be fully responsible for the performance of its subcontractors, including those recommended or approved by the Owner.

...

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. ~~If the proposed but rejected Subcontractor was~~ When the parties agree on a proposed substitute Subcontractor reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected ~~if the Owner or Architect makes reasonable objection to such substitution without providing reasonable written notice to the Owner and Architect.~~ If neither the Owner nor Architect submits a reasonable objection to such proposed substitution within ten (10) days following their receipt of written notice the Contractor may proceed with the substitution. If either Owner or Architect submit an objection, the Subcontractor shall proceed in accordance with Section 5.2.3 above.

§ 5.2.5 Each Contractor or subcontractor shall be required to completely familiarize itself with the plans and specifications, to visit the Work site to completely familiarize itself with existing conditions, and to conduct any other appropriate investigations, inspections or inquiries prior to submission of a bid or proposal. No increases in Contract Sum shall be allowed for failure to so inspect or investigate.

...

~~By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into~~

similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. The terms and conditions of the Contract Documents shall be incorporated by reference into each subcontract agreement, included as provided below. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors. Each subcontractor shall provide proof of insurance to Contractor consistent with the Contractor's insurance to Owner and in an amount commensurate with the Work to be performed by the Subcontractor.

§ 5.3.2 Neither the Owner nor the Architect shall be obligated to pay or to insure the payment of any monies to Subcontractors or vendors by the Contractor.

§ 5.3.3 The Contractor shall require any potential Subcontractor to disclose to the Contractor any ownership interest or familial relationship between the Contractor, the Architect or the Owner and the potential Subcontractor prior to entering into a contract. Contractor shall report to Owner all such disclosures and the Owner shall have the right, in its sole discretion, to reject any such affiliated Subcontractor.

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§ 5.4.1 Each subcontract agreement for a ~~any~~ unperformed portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner ~~for cause pursuant to Section 14.2 or~~ abandonment of the Project by the Contractor and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and ~~Contractor~~; and Contractor in writing;
- .2 assignment is subject to the prior rights and obligations of the surety, if any, obligated under bond relating to the ~~Contract~~.Contract; and
- .3 The Subcontractor provides bonds as required by law of prime contractors and by Owner.

...

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation ~~shall may, in the Owner's sole discretion,~~ be equitably adjusted for increases in cost resulting from the suspension. Such assignment shall not constitute a waiver by Owner of its rights against Contractor, including, but not limited to, claims for defaults, delays or defects for which a subcontractor or material vendor may also be liable.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. ~~If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.~~ Owner shall only be responsible for compensating subcontractors for Work performed or materials furnished from and after the date on which the Owner gives written notice of its acceptance of the subcontract agreement. Owner shall not be responsible for any Work performed or materials furnished by subcontractors prior to the date of Owner's written notice of acceptance.

§ 5.5 Notice Of Subcontractor Default

Contractor shall promptly notify Owner and Architect of any material defaults by any Subcontractor or Sub-subcontractor. Notwithstanding any provision contained in Article 5 to the contrary, it is hereby acknowledged and agreed that Owner has in no way agreed, expressly or implicitly, nor will Owner agree, to allow any Subcontractor, Sub-subcontractor or other materialman or worker employed by Contractor the right to obtain a personal judgment or to create a mechanic's or materialman's lien against Owner for the amount due from the Owner or the Contractor.

...

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, ~~including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.~~Contract.

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§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual ~~agreement.~~agreement by the Owner and Contractor. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 ~~Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.~~[Paragraph Deleted.]

...

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for site access, staging, introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. ~~The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.~~

§ 6.2.3 All costs resulting from the Contractor's negligence, lack of oversight, inattention to detail, failure to investigate, or failure to follow the Construction Documents or Contract Documents, will be borne by the Contractor. The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a ~~Separate Contractor~~ Contractor, the Architect or any Consultant because of the Contractor's delays, improperly timed activities ~~or defective construction.~~ The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

...

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the ~~Architect-Owner~~ will allocate the cost among those responsible.

...

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Changes may be funded out of a contingency fund, if any, or other allowance established herein, or may require a change in the Contract Sum. The authority to approve a change to the Work, the Contract Sum, approve payment from a Contingency or Allowance, or a change in the Project Time, rests solely with the Owner. A Change Order funded from the Contingency or other Allowance shall be referred to herein for clarity as a "Contingency Authorization Order".

§ 7.1.2 A Contingency Authorization Order or Change Order shall be based upon agreement among the Owner, Contractor, and ~~Architect~~. ~~A Construction Change Directive~~ Architect ~~executed prior to commencement of any Work covered by the Order. A Construction Change Directive (whether funded from contingency, if any, or by an increase in the Contract Sum) requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor.~~ the Contractor prior to the commencement of the Work. An order for a minor change in the Work may be issued by the Architect ~~alone~~, except as otherwise provided herein.

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§ 7.1.4 Change Order Mark-Up. On Change Orders and Construction Change Directives, the total Contractor mark-up for overhead, profit permitted to be charged to the Owner shall be based on the following schedule:

- .1 for work performed by the Contractor's own forces, Contractor's mark-up for overhead and profit shall not exceed 10% of the cost of the change in the Work (0% for change orders to be paid out of any contingency allowance).
- .2 for the Contractor, for supervision of work performed by the Contractor's Subcontractors, the total Contractor mark-up for overhead and profit shall not exceed 4% of the amount due to the Subcontractors (0% for change orders to be paid out of any contingency allowance).
- .3 for each Subcontractor or Sub-subcontractor involved, in Work performed by that Subcontractor's or Sub-subcontractor's own forces, the total mark-up for overhead and profit ten percent (10%) of the cost of the change in the Work.
- .4 In no event shall total mark-up for overhead, profit or fee in any work which involves a subcontractor or one or more sub-subcontractors, regardless of who performs the work, exceed 14% of the total cost of the change in the Work. The Contractor will not be allowed an overhead, profit, or fee mark-up when changes in the Work are funded by Contingency or other Allowances provided for in the Contract Documents.

...

Methods used to determine adjustments to the Contract Sum or Guaranteed Maximum Price may include those listed in Section 7.3.3.

§ 7.2.2 Acceptance of a disbursement from any allowance fund, contingency fund or acceptance of a Change Order by the Contractor shall constitute full accord and satisfaction for any and all claims, whether direct or indirect, including but not limited to impact, delay or acceleration damages, arising from the subject matter of the disbursement or Change Order.

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum (the Guaranteed Maximum Price, as applicable) or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly ~~(the Guaranteed Maximum Price, as applicable)~~ and Contract Time being adjusted as provided in Section 7.3.3.

...

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract ~~Sum~~, Sum (or the Guaranteed Maximum Price, as applicable), the adjustment shall be based on one of the following methods:

...

- .2 Unit prices stated in the Contract Documents or subsequently agreed upon; ~~upon~~ (additional mark-ups for overhead and profit will not be allowed);
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; ~~fee, subject to the limitations of subparagraph 7.1.4; or~~

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§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract ~~Sum~~, Sum (or the Guaranteed Maximum Price, as applicable), the Architect shall determine the adjustment on the basis of ~~reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 of the amount by which the Contractor's direct costs have actually been increased over the direct cost of performing the Work without the Change in the Work. Direct costs shall be limited to the following:~~

- .1 ~~Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, Actual documented costs of labor, including applicable payroll taxes and other employee costs approved by the Architect; the Owner prior to the approval of the Change Order or Contingency Authorization Order (a labor burden factor will not be accepted as documentation);~~
- .2 ~~Costs~~ Actual documented costs of materials, supplies, and equipment, including cost of transportation, whether such materials, supplies, and equipment are incorporated or consumed;
- .3 ~~Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; Actual documented rental costs of machinery and equipment, if rented from unaffiliated third-parties, exclusive of hand tools;~~
- .4 ~~Costs~~ Actual documented costs of premiums for all bonds and insurance, permit fees, and applicable sales, use, or similar taxes, directly related to the change; change, if any; and
- .5 ~~Costs~~ Actual documented costs of supervision and field office personnel directly attributable to the change. the change and only if the adjustment causes an extension of the Contract Time.

The Contractor shall keep and present, in such form as the Architect or Owner may prescribe, an itemized accounting of the items listed above, together with appropriate supporting documentation.

§ 7.3.5 If the Work is performed without an agreement as to the final price, the Contractor shall, at a minimum, retain and provide to the Owner, the following documentation to adequately document its actual costs of performing the scope of work set out in a Construction Change Directive. Adequate Documentation shall include at a minimum, but not limited to, payroll records for employees of Contractor providing the Work included in the Change Directive, as well as written documentation of time spent **solely** on the scope of the Change Directive Work, prepared concurrent with the performance of the Work, including (for example) sign-in and sign-out sheets or time cards, executed by the employee(s) documenting attendance and receipts for all materials delivered to the Project site for incorporation in the Work of the Change Directive and paid for by the Contractor. If any of the Work of the Change Directive is performed by subcontractors, the Contractor shall provide a copy of the subcontract, an itemized invoice or payment application which includes, in either case, a detailed itemization of costs showing quantities and unit costs of labor and materials extended and totaled and, if permitted, overhead and profit (in accordance with Section 7.1.4) labor and materials provided by the subcontractor, with receipted invoices for all materials incorporated in the Work and evidence of payment by the subcontractor attached. If the Contractor disagrees with the adjustment in the Contract Time, the Contract Sum (or the Guaranteed Maximum Price, as applicable), allowed in any Change Directive, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement (by executing and returning the Change Directive) or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time. Time, not later than ten (10) calendar days following the Contractor's receipt of the Construction Change Directive. A copy of a notice of disagreement shall also be provided to the Owner concurrent with the notice to the Architect. A Notice of Disagreement must contain the number of the Change Directive, the date the Change Directive was issued and the words **"Notice of Disagreement With Change Directive"** in the Subject line. It is imperative that Owner receive timely specific notice of any potential problem identified by Contractor in order that the problem can be mitigated or resolved promptly.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum ~~and~~ and/or the Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost ~~as confirmed by the Architect, plus the permitted overhead and profit as set forth in Section 7.1.4.~~ When both additions and credits covering related Work or substitutions are involved in a change, both changes shall be shown on the same Change Order and the permitted allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change. Returned materials shall be credited at actual cost and no penalty or restocking fee shall be permitted to be charged to the Owner.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will require as a condition precedent to certification of payment for Work completed under the Construction Change Directive that the Contractor provide the documentation required by Section 7.3.4, and based on such documentation, shall make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect is specifically authorized by this Section 7.3.9 to require submission of such documentation and any other documentation required to evaluate the requested payment, and shall withhold payment certification until such documentation is received and an interim determination is made in accordance with this Section. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. ~~Order reflecting the Agreement of the Owner and Contractor.~~ Change Orders may be issued for all or any part of a Construction Change Directive.

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~~The~~ With prior written notice to the Owner's representative, the Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time. The Contractor shall carry out such written orders promptly. Minor changes in the Work shall not include changes that involve the outward appearance of the structure, color schemes, floor plans, building materials, landscaping, or mechanical equipment.

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§ 8.1.1 **Contract Time.** Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 Commencement. ~~The date of commencement of the Work is the date established in the Agreement, shall be the first business day following the Contractor's written notice to proceed. The notice to proceed shall not be issued until the Agreement (or Guaranteed Maximum Price Amendment, as applicable) has been signed by the Contractor and the Owner, and the Owner and Architect have received and approved as to form all required payment and performance bonds and insurance as required by Article 11.~~

§ 8.1.3 ~~The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.~~ **Substantial and Final Completion**

§ 8.1.3.1 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.3.2 The date of Final Completion is the date certified by the Architect in accordance with Section 9.10. Unless otherwise agreed in writing by Owner, Contractor agrees that Final Completion shall occur not more than thirty (30) days after the date of Substantial Completion.

§ 8.1.4 Day. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor ~~confirms~~ stipulates that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the ~~Contractor and Owner~~ Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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§ 8.2.4 Liquidated Damages

§ 8.2.4.1 If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and the Contractor's surety, as liquidated damages and not as a penalty, the per diem amounts set out in the AIA Document A101 (2017) into which these General Conditions are incorporated and executed concurrently with these General Conditions, commencing upon the first day following expiration of the Contract Time and continuing until the actual Date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work.

§ 8.2.4.2 In the event Substantial Completion is not achieved by the designated date, or as it may be extended, Owner may withhold payment of any further sums due until Substantial Completion is achieved. Owner shall also be entitled to deduct out of any sums due to Contractor all liquidated damages, if any, due Owner in accordance with the Contract Documents.

§ 8.2.4.3 In addition to Liquidated Damages, if any, the Contractor shall reimburse the Owner for any Supplemental or Additional Services of the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor or caused by Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.2.4.4 If one or more of the Liquidated Damages provisions set out in the Agreement are held to be legally unenforceable as a penalty (except when the holding is the result of a challenge by the Owner), the Owner shall be allowed to recover actual damages caused by the Contractor's failure to achieve the applicable Contract Time requirements.

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) ~~an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor;~~ (2) ~~by changes ordered in the Work;~~ (3) ~~by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, war, civil commotion, pandemic, epidemic, federal, state or local declared disaster or public emergency, act of God, governmental restrictions, regulations, orders, or interference, fire or other unavoidable casualty, material changes ordered in the Work;~~ adverse weather conditions documented in accordance with Section 45.1.6.2, or other causes beyond the Contractor's control; (4) ~~by delay authorized by the Owner pending mediation and binding dispute resolution; or~~ (5) 15.1.6 by delay

authorized in writing by the Owner prior to the happening of the delay event; or by other causes that the Contractor asserts, and the Architect ~~determines, and Owner determine,~~ justify delay, then the Contract Time ~~shall~~ may be extended for such reasonable time as the Architect ~~may determine and Owner may determine based upon~~ documentation by the Contractor.

§ 8.3.1.1 The adjustment of the Contract Time for delay, disruption, and interference described in this Section 8.3.1 is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time and Contractor's timely delivery of the notice and claim as set out in this Section 8.3.1. An adjustment to the Contract Time shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this Section 8.3.1, and under no circumstances shall the Owner be liable to pay the Contractor any compensation for Owner-caused delays.

§ 8.3.1.2 Notice and Claim for Extension. In the event of a delay in the commencement or progress of the Work as a result of any of the circumstances in this Section 8.3.1, the Contractor may receive an extension of time for completion of the Work equal to the delay, if the Contractor delivers a written notice and claim to the Owner and Architect delivered in any manner provided in Section 1.6.1 of this Agreement. The Notice shall identify and provide a reasonably detailed description of the circumstances causing the delay, disruption, or interference to the Contractor's performance or progress of the Work on or before the due date of Contractor's Application for Payment covering the period in which the delay began. Claims for an extension of time shall be stated in whole or half calendar days, as applicable. The actual date on which the delay(s) began and/or the date the delay ended, if applicable, must be stated in the Claim Notices as applicable.

§ 8.3.2 ~~Claims relating to time shall be made in accordance with applicable provisions of Article 15.~~ In the case of claims for extension of time because of unusually inclement weather, such extension of time may be granted only if the Contractor files a claim in accordance with the requirements set out in Section 15.1.6.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents. Contractor shall not be entitled to an adjustment in the Contract Time for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

§ 8.3.4 Any adjustment of the Contract Time authorized under Section 8.3 shall be conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Time and Contractor's submission of a timely and properly documented Notice and Claim for additional time in accordance with Section 8.3.

§ 8.3.5 Adjustments to the Contract Time addressed in this Section 8.3 shall apply only to requests for extensions of time based upon delay, disruption, or interference to the Contractor's performance or progress of the Work and shall have no applicability to requests for adjustment of the Contract Time due to other changes in circumstance, including but not limited to: a change in the materials used; a change in the specified manner of constructing and/or installing the Work; or additional labor, services or materials required, beyond those specified by the Contract Documents. Claims for an adjustment of the Contract Time resulting from these kinds of changes shall be authorized only pursuant to a written order or directive from Owner authorizing Contractor to proceed with a change in the Work in accordance with the Contract Documents.

§ 8.4 No Damages or Other Compensation for Delay or Acceleration

This Agreement does not permit recovery by the Contractor of damages or additional compensation for delay, acceleration, disruption, or interference to the Contractor's performance or progress of the Work Contractor agrees that Contractor shall be fully compensated for all delays solely by an extension of time including but not limited to delay, disruption, or interference caused by the Owner the Architect, of an employee of either, or of a Separate Contractor, any of the circumstances set out in Section 8.3.1 or acceleration of the Work required by the Owner in accordance with the terms of this Agreement. Contractor's sole remedy for delay disruption, or interference in its performance or progress of the Work or any required acceleration of the Work shall be the grant of an extension of time for completion equal to a delay or such reasonable time as the Owner and Architect may determine in their sole discretion.

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§ 9.1.1 The Contract Sum is stated in the Agreement or the Guaranteed Maximum Price Amendment in the case of a Construction Manager at Risk Contract and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. All costs of overtime Work required by the Contract Time and the nature of the Work, as set forth in or inferable from the Contract Documents, except costs of emergencies covered in Section 10.4, shall be and are included in the Contract. The Contract Sum shall not be increased because the Contractor experiences an unexpected or unforeseeable increase in the price of labor or materials required to complete the Project.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices ~~shall be equitably adjusted.~~ may be equitably adjusted by written agreement between the Owner and Contractor, executed prior to an order being placed based on the unit prices.

...

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, as applicable, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, Payment or, in the case of a Guaranteed Maximum Price, concurrent with the Guaranteed Maximum Price Proposal, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, or the Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The schedule of values shall be prepared in such a manner that each major item of work, whether done by Contractor's own forces or subcontracted, is shown as a single line item on AIA Documents G702-1992 and G703-1992, Application and Certificate for Payment and Continuation Sheet.

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§ 9.3.1 ~~At least ten days before the date established for each progress payment,~~ In accordance with the requirements of Section 5.1 of the Agreement, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents, withheld. The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA Document G702-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA Document G703-1992, Continuation Sheet.

§ 9.3.1.1 ~~As provided in Section 7.3.9, such~~ Such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor ~~does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.~~ has not been invoiced by a Subcontractor or supplier, unless such Work was self-performed; in such case, only portions of Work actually performed shall be included on the Contractor's request for payment.

§ 9.3.1.3 Contractor agrees that, for purposes of Texas Government Code section 2251.042, receipt of the Application for Payment by the Architect shall not be construed as receipt of an invoice by the Owner. Contractor further agrees that Owner's receipt of the Architect's Certificate for Payment shall be construed as a receipt of an invoice by the Owner, for purposes of Texas Government Code section 2251.042.

§ 9.3.1.4 The Owner shall withhold retainage as provided in the Agreement, except that Owner shall not pay amounts for which the Architect refuses to certify payment, or the Owner refuses to pay, as provided herein. The retainage shall be paid to the Contractor with the Final Payment, subject to the requirements of the Contract Documents.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall a separate written agreement executed between the Owner and Contractor prior to delivery, payments shall not be made on account of materials and equipment delivered and suitably stored at the site or off-site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. The Owner may, in Owner's sole discretion, require Contractor's compliance with such reasonable procedures and requirements as it may establish, as a condition precedent to the grant of Owner's consent and agreement to payment, including but not limited to the following:

- .1 provision of any additional insurance required to protect the materials and equipment while stored;
- .2 payment of the costs to store the materials and equipment and any additional transportation costs for multiple deliveries;
- .3 provision of written consent of Contractor's surety to such storage;
- .4 submission of an affidavit identifying materials and equipment stored off-site for later incorporation into the Work, and acknowledging responsibility for such materials and equipment;
- .5 provision of documentation that the facility where the materials and/or equipment will be stored is an adequately insured commercial warehouse, where the materials and equipment stored will be sheltered from the weather and outside elements and are stored in accordance with the manufacturer's instructions, including proper temperature and humidity controls and that the materials and equipment have been physically separated and marked for the Project;
- .6 its agreement to bear the cost of Owner and/or Architect's visits to the off-site storage facility to confirm compliance with these requirements and review the stored contents, and Contractor shall agree to allow such costs to be offset from Progress Payments;
- .7 agreement that payment of any costs related to compliance with the procedures and requirements for storage of materials and equipment on or off-site, shall not be subject to charges for overhead or profit;
- .8 submission of bills of sale or other documentation acceptable to the Owner, showing proof of delivery and establishing the Owner's title to the materials or equipment and/or otherwise protecting the Owner's interest, including naming the Owner as additional insured on the required insurance policy (naming the specific materials or equipment stored and their location) and providing proof of delivery for those materials and equipment;
- .9 agreeing that, in the event of termination of the Contract or default by the Contractor, the material and equipment stored on or off-site shall be immediately turned over to the Owner by delivery to the location designated by the Owner and that the operator of the storage facility is aware of this agreement and willing to honor it; and
- .10 agreeing that all such stored materials and equipment, to the extent they include mechanical components, will be maintained by the Contractor kept in good working condition and ready for immediate installation, to the same extent they would have been, had they been delivered "just in time" for installation, that Contractor will be solely responsible for assuring any manufacturer's warranty will commence on date of completion of installation and/or start-up of the material or equipment and for repairs required prior to installation to assure performance in accordance with the Contract Documents.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. **CONTRACTOR SHALL INDEMNIFY AND HOLD OWNER HARMLESS FROM ANY LIENS, CLAIMS, SECURITY INTERESTS OR ENCUMBRANCES FILED BY A SUPPLIER, SUBCONTRACTORS, OR ANYONE CLAIMING BY, THROUGH OR UNDER THE CONTRACTOR OR SUBCONTRACTOR FOR ITEMS COVERED BY PAYMENTS PREVIOUSLY MADE BY THE OWNER TO CONTRACTOR FOR ITEMS COVERED BY PAYMENTS MADE BY THE OWNER TO CONTRACTOR.**

§ 9.3.4 In each Application for Payment, Contractor shall certify that: the information contained in the Application presented is true, correct, accurate and complete; that the submitted Work has been completed to the extent

represented in the Applications for Payment; that the materials and supplies identified in the Applications for Payment have been purchased, paid for, and, unless an agreement described in Paragraph 9.3.2 has been signed, incorporated into the Work; that the subcontractors whose work is identified in the Applications for Payment have been paid, or Contractor has been invoiced for same and intends to pay such subcontractors; there are no known mechanics' or materialmen's liens outstanding at the date of the Application, that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current Application and that except for such bills not paid but so included, there is no known basis for the filing of any mechanics' or materialmen's liens on the Work, and that releases from all contractors and materialmen have been obtained in such form as to constitute an effective release of lien under the laws of the State of Texas covering all Work theretofore performed and for which payment has been made by Owner to Contractor.

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§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, carefully evaluate and review the Application for Payment and, when appropriate, return the Application for Payment to the Contractor as provided in Section 9.4.2. If the Application for Payment is complete, then the Architect shall sign and, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing, of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner in writing, of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. Architect's written reasons for withholding certification shall be construed as the notice required by Texas Government Code Section 2251.042 et seq.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, that the Architect has observed the progress of the Work and determined that, in the Architect's professional opinion based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. Architect in writing to the Owner. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data unless requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum. Examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's accountants or other representatives of the Owner acting in the sole interest of the Owner.

§ 9.4.3 The issuance of a Certificate for Payment shall constitute a recommendation to the Owner regarding the amount to be paid. This recommendation is not binding on the Owner if Owner knows of other reasons under the Contract Documents why payment should be withheld.

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- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents; the Contract Documents;
- .8 delay beyond the times set forth elsewhere in the Contract Documents including but not limited to the submission for approval of the schedule of values, cost breakdowns on proposal requests, progress schedule, list of Subcontractors and insurance requirements;
- .9 failure to submit a written plan indicating action by the Contractor to regain the time schedule for completion of Work within the Contract Time;
- .10 evidence of financial inability to perform the Contract fully;
- .11 failure to submit record documents required by the Contract; or
- .12 failure of the Contractor to perform any other obligations of the Contract.

~~§ 9.5.2 When either party disputes the Architect's~~ If the Contractor disputes the Architect's or the Owner's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, ~~that party the Contractor~~ may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld. The Owner shall not be deemed in default by reason of withholding payment as provided for in Section 9.5.1.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment. Notwithstanding any provision contained within this Article, if the Contractor has not achieved Substantial Completion by the required date, subject to extensions of time allowed under the Contract Documents, then Architect may withhold any further Certificate for Payment to the extent necessary to preserve sufficient funds to complete construction of the Project and to cover liquidated damages. The Owner shall not be deemed in default by reason of withholding payment as provided for in Section 9.5.1, or this Section 9.5.4.

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§ 9.6.1 After the Architect has issued and the Owner has approved a Certificate for Payment, the Owner shall make payment of disputed amounts in the manner and within the time provided in the Contract Documents, and ~~shall so notify the Architect in accordance with the Texas Government Code section 2251.042 et. seq.,~~ Owner shall within twenty-one (21) days notify the Architect and Contractor if Owner disputes the Architect's Certificate for Payment, listing the specific reasons for nonpayment. Payments to the Contractor shall not be construed as releasing the Contractor or his Surety from any obligations under the Contract Documents.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after ~~In compliance with Texas Government Code Section 2251.022,~~ the Contractor shall, within ten (10) days following receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. pay all bills for labor and materials performed and furnished by others in connection with the construction, furnished and equipping of the improvements and the performance of the Work, and shall, if requested, provide the Owner with evidence of such payment. Contractor's failure to make payments within such time shall constitute a material breach of this contract. Contractor shall include a provision in each of its contracts imposing the same payment obligations on its Subcontractors as are applicable to the Contractor hereunder. If the Contractor has failed to make payment promptly to the Contractor's Subcontractors or for materials or labor used in the Work for which the Owner has made payment to the Contractor, the Owner shall be entitled to withhold payment to the Contractor in part or in whole to the extent necessary to protect the Owner.

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§ 9.6.7 ~~Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum,~~ payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for ~~The Contractor shall, as a condition precedent to any obligation of the Owner under the Contract Documents, provide to the Owner payment and performance bonds in the full penal amount of the Contract in accordance with Texas Government Code Chapter 2253. Notwithstanding the foregoing, payments received by the Contractor from the Owner for Work properly performed by Subcontractors, or materials properly provided by suppliers, shall be held in trust by the Contractor for the benefit of those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.~~ Contractor.

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If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Pursuant to Texas Government Code Section 2251.051, if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' any payment certified by the Architect, which is undisputed, due and owing after the date the payment is due under the Contract Documents, then the Contractor may, upon ten (10) days' written notice to the Owner and Architect, that payment has not been made and the Contractor intends to suspend performance for nonpayment, may stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents. undisputed amount owing has been received. If the Owner provides written notice to the Contractor that: 1) payment has been made; or 2) a bona fide dispute for payment exists, listing the specific reasons for nonpayment, then Contractor shall be liable for damages resulting from suspension of the Work. If a reason specified is that labor, services, or materials provided by the Contractor are not provided in compliance with the Contract Documents, then the Contractor shall be provided a reasonable opportunity to cure the noncompliance or to compensate Owner for any failure to cure the noncompliance. No amount shall be added to the Contract Sum as a result of a dispute between Owner and Contractor unless and until such dispute is resolved in Contractor's favor.

§ 9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, then such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due to Owner, pursuant to the Contract, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, then the Owner shall have an absolute right to offset such amount against the Contract Sum and, in the Owner's sole discretion and without waiving any other remedies, may elect to either: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due to Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

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§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project (or if the same cannot be delivered for reasons not the fault or responsibility of the Contractor, nevertheless all Contractor's obligations necessary to the issuance of such certificates, permits, approvals, or licenses will have been performed.) Without limiting the foregoing, in general, the only remaining Work following Substantial Completion shall be minor in nature, so that the Owner could occupy the Project on that date and the completion of the Work by the Contractor would not materially interfere or hamper the Owner's normal school business operations.

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§ 9.8.3 Upon receipt of the Contractor's list, the Architect accompanied by the Owner or Owner's representative, at the Owner's option, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, then the Architect shall so notify the Contractor and Owner in writing, and the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.3.1 If, in Architect's opinion during the inspection, the Project, or the designated portion thereof which Owner has agreed to accept separately, is not sufficiently complete to warrant inspection, or if the list of items to be completed or corrected is not sufficiently complete to warrant inspection, then Architect may terminate the inspection and notify the Contractor that the Project is not ready for inspection. If for such reasons, Architect is required to make additional inspections, the Owner may deduct the cost of Architect's additional services made necessary thereby from any

payments due the Contractor. The Architect's compensation shall be determined in accordance with the applicable provisions of the Agreement between the Owner and Architect.

§ 9.8.3.2 Except with the consent of the Owner, the Architect will perform no more than ONE (1) inspection to determine whether the Work has attained Substantial Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect, Engineer, Consultant or service provider for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, Substantially Complete, as defined by the Contract Documents, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof, unless otherwise provided in the Certificate of Substantial Completion. If Work is to be completed or corrected after the date of Substantial Completion and prior to final payment, Warranties for Work to be completed or corrected after the date of Substantial Completion and prior to final payment shall become effective on the later of the date the Work is completed or corrected and accepted by the Owner and Architect, or the date of Final Payment. ("Warranty Commencement Date").

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.8.6 Retainage is not due to the Contractor until thirty-one (31) days after Final Completion of the Work as set out in Section 9.10. After the Certificate of Substantial Completion is accepted by the Owner, the Owner may, in its sole discretion and upon acceptance and consent of surety, make payment of retainage on all or a part of the Work accepted.

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§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to in writing by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work resulting from such occupancy, use or installation, and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2, on the partially completed portion of the Work, as required by the Contract Documents.. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect. Contractor agrees that the Owner may place and install as much equipment and furnishings as is possible before completion or partial completion of portions of the Work.

...

§ 9.9.3 Unless otherwise agreed upon, expressly agreed upon in writing, partial occupancy or use of a portion or portions of the Work or installation of furnishings and equipment shall not constitute acceptance of Work not complying with the requirements of the Contract Documents. Documents, nor shall it constitute evidence of Substantial Completion or Final Completion.

...

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract When all of the Work is finally completed and

the Contractor is ready for a final inspection it shall notify the Owner and the Architect thereof in writing. Thereupon, the Architect and Owner (at Owner's option) will make final inspection of the Work and, if the Work is complete in full accordance with the Contract Documents and this Contract has been fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the certifying to the Owner that the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor remainder of the Contract Sum, including all retainage, less any amount withheld pursuant to the Contract and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. Except with the consent of the Owner, the Architect will perform no more than one (1) inspection to determine whether the Work has attained Final Completion in accordance with the Contract Documents. If the Architect is unable to issue its final Certificate for Payment and is required to repeat its final inspection of the Work, the Contractor shall bear the cost of such repeat final inspection(s) which cost may be deducted by the Owner from the Contractor's final payment.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) ~~an~~ its affidavit that payrolls, bills for materials and equipment, and other ~~indebtedness liabilities~~ connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) ~~if required except for amounts previously withheld~~ by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may ~~have been fully paid or otherwise satisfied; releases and waivers of liens from all Subcontractors of the Contractor and of any and all other parties required by the Architect or the Owner; such other provisions as Owner may request; and consent of Surety to final payment.~~ If any third party fails or refuses to provide a release of claims or waiver of lien as required by Owner, the Contractor shall furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. discharge any such lien or indemnify the Owner from liability; (7) In addition, the following items must be completed and received by the Owner before Final Payment will be due:

- .1 Written certifications required by Sections 10.5, 10.6, and 10.7 herein;
- .2 Final list of subcontractors (AIA Document G705-2001);
- .3 Contractor's Certification of Project Compliance required by 16 Texas Administrative Code, Section 61.1036, located at: <https://tea.texas.gov>;
- .4 Contractor's warranties, organized as required elsewhere in the Contract Documents;
- .5 Maintenance and Instruction Manuals;
- .6 Owner's Certificate of Final Completion; and
- .7 "As-constructed record drawings". At the completion of the Project, the Contractor shall submit one complete set of "as-constructed" record drawings, with all changes made during construction, including concealed mechanical, electrical, and plumbing items. The Contractor shall submit these as electronic, sepia, or other acceptable medium, in the discretion of the Owner. The "as-constructed" record drawings shall delete the seal of the Architect and/or the Engineer and any reference to those firms providing professional services to the Owner, except for historical or reference purposes.

Documents identified as affidavits must be notarized. All manuals will contain an index listing the information submitted. The index section will be divided and identified by tabbing each section as listed in the index. Upon request, the Architect will furnish the Contractor with blank copies of the forms listed above.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If

the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it The Owner shall make final payment of all sums due the Contractor not more than thirty-one (31) days after the Architect's execution of a final Certificate for Payment. Final Payment shall not constitute a waiver of Claims.any Claims by the Owner.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from
1 — liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
2 — failure of the Work to comply with the requirements of the Contract Documents;
3 — terms of special warranties required by the Contract Documents; or
4 — audits performed by the Owner, if permitted by the Contract Documents, after final payment. [Paragraph Deleted.]

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously ~~made in writing asserted pursuant to Article 15~~ and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.10.6 The Contractor shall not permit any actual or purported lien, charge or claim to attach or attempt to attach to the Work, the site or any amounts due or to become due to the Contractor under the Contract Documents. If any such lien, charge or claim is so asserted, the Contractor shall promptly procure its release and indemnify the Owner against all damage and expense incident thereto. Upon completion of the Work and before any final payment and settlement, the Contractor shall provide evidence satisfactory to the Owner of payment and release of all debts, taxes, liens, charges, obligations and claims for or relating to labor, materials, Subcontractors and Sub-subcontractors; provided, however, that if the Contractor has not paid for any of the aforesaid as a result of a bona fide dispute, and payment of such is guaranteed and covered by the payment bond provided by the Contractor, then the Contractor shall not be required to pay such claim as a condition to final payment and settlement, but instead shall be required to provide Owner with written consent to final payment executed by such surety, expressly acknowledging the existence of such unpaid claim, and agreeing that full and final payment to the Contractor shall not impair any of the Owner's rights or the surety's obligations under the bond.

§ 9.11 Audit

Contractor agrees to maintain adequate books, payrolls and records satisfactory to the Owner in connection with any and all Work performed hereunder. Contractor agrees to retain all such books, payrolls and records (including data stored in computer) for a period of not less than three (3) years after completion of the Work. At all reasonable times, Owner and its duly authorized representatives shall have access to all personnel of Contractor and all such books, payrolls and records, and shall have the right to audit same.

§ 9.12 In addition to any liquidated damages payable to the Owner by the Contractor, if: (1) the Architect is required to make more than one (1) inspection for Substantial Completion; (2) the Architect is required to make more than 1 inspection for Final Completion; or (3) the Work is not substantially complete within thirty (30) days after the date established for Substantial Completion in the Contract Documents; the Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional inspections or services.

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The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the ~~Contract~~ Contract and shall conform to all provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, Inc., latest edition, and the Contractor further agrees to fully comply with all safety standards required by the Occupational Safety and Health Administration ("OSHA") 29 USC Section 651 et seq., and all amendments thereto. However, the Contractor's duties herein shall not relieve any Subcontractor or any other person or entity, including any person or entity required to comply with all applicable federal, state and local laws, rules, regulations, and ordinances, from the obligation to provide for the safety of their employees, persons, and property and their requirements to maintain a work environment free of recognized hazards. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.1.1 Contractor shall ensure that the Project site is alcohol-free, drug-free, nicotine/ tobacco-free, e-cigarette free, weapon-free, and sexual-harassment free, and shall require strict compliance on the Project Site with the Owner's Board Policies, including but not limited to GKA(Legal) and GKA(Local). Contractor will remove any of its employees from performing the Work any time there is suspicion of alcohol and/or drug use, possession, or impairment involving such employee, and at any time an incident occurs where drug or alcohol use could have been a contributing factor. Owner has the right to require Contractor to remove employees from performing the Work any time cause exists to suspect alcohol or drug use. In such cases, Contractor's employees may only be considered for return to work after the Contractor certifies as a result of a for-cause test, conducted immediately following removal that said employee was in compliance with this contract. Contractor will not use an employee to perform the Work who either refuses to take, or tests positive in, any alcohol or drug test.

10.1.2 Dress Code, Fraternization and Sexual Harassment. Contractor shall require adequate dress of the Contractor's forces consistent with the nature of the Work being performed, including wearing shirts at all times. Contractor shall prohibit fraternization between all persons working under Contractor or any of its subcontractors, students and Owner's employees while on Owner's property. Sexual harassment of employees of the Contractor or employees or students of the Owner by employees of the Contractor is strictly forbidden. Any employee of the Contractor who is found to have engaged in such conduct shall be subject to appropriate disciplinary action by the Contractor, including removal from the job site.

§ 10.1.3 Weapons. Owner has also banned use, possession, or display of any firearm, handgun, location-restricted knife, club, or "prohibited weapon", as defined by the Texas Penal Code and Owner's Board Policy FNCG(Legal), except when the Contractor, its representatives, employees, agents, and subcontractors, or anyone else over which the Contractor has control or authority holds a Texas handgun license, stores the handgun or other firearm in a locked vehicle in the Owners parking lot, garage, or other parking area provided by the Owner AND the firearm is not loaded and not in plain view. A copy of such policy is available through a link on the Owner's website. The Contractor further agrees that Contractor's representatives, employees, agents, and subcontractors will abide by these requirements as well as the Federal Gun-Free School Zones Act.

§ 10.1.4 Tobacco and E-Cigarettes. Contractor's employees, agents, Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, shall not use e-cigarettes or tobacco products while on the Project Site.

§ 10.1.5 Small Unmanned Aircraft (Drones). The Contractor shall operate any Small Unmanned Aircraft as required by 14 C.F.R. Part 107, as applicable, and any other applicable federal or state laws and regulations.

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§ 10.2.1 The Contractor shall maintain good order among its employees and its Subcontractors, shall confine its employees and Subcontractors to such work areas, roads and gates as directed by the Owner, take reasonable and necessary precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees ~~on the Work~~ on the Work, school personnel, students and other persons on the Owner's premises and other persons who may be affected ~~thereby~~; thereby, which protection shall include the installation of fencing between the Work site and the occupied portion of a connecting or adjacent educational facility, and taking reasonable precautions to secure any abusable glue, aerosol paint, or any other chemical substance for inhalation being used on the project site;

...

- .3 other property at the site or adjacent thereto, such as fences, trees, shrubs, lawns, walks, athletic fields and tracks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction. Contractor's obligations under this Section shall continue to apply during any time period when all or a portion of the Work is suspended for any reason. Contractor's obligations under Section 10.2 as to each portion of the Project shall continue until Owner takes possession of and occupies that portion of the Project.

...

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including installing fencing, posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards. The Contractor shall also be responsible, at the Contractor's sole cost and expense, for all measures necessary to protect any property adjacent to the Project and improvements therein. Any damage to such property or improvements shall be promptly repaired by the Contractor. Contractor shall provide reasonable fall protection safeguards and provide approved fall protection safety equipment for use by all exposed Contractor employees.

§ 10.2.4 When use or storage of ~~explosives or other~~ hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified ~~personnel~~ personnel, and shall only conduct such activities after giving reasonable advance written notice of the presence or use of such materials, equipment or methods to Owner and Architect. The storage of explosives on Owner's property is prohibited. The use of explosive materials on Owner's property is prohibited unless expressly approved in advance in writing by Owner and Architect.

§ 10.2.5 ~~The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18. [Paragraph Deleted.]~~

...

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. **§ 10.2.8.1** If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 3 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter. No provision of the Contract Documents shall waive Owner's immunity under the Texas Tort Claims Act, Texas Civil Practice and Remedies Code, Chapter 101.

§ 10.2.8.2 The Contractor shall promptly report in writing to the Owner and Architect all accidents arising out of or in connection with the Work which cause death, bodily injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious bodily injuries, or serious property damages are caused, then the accident shall be reported immediately by any means necessary to give actual notice to the Owner's representative and the Architect.

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§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition. If such notice is provided orally, written confirmation of such notice by Contractor shall be provided not later than one (1) business day following such notification. Owner shall not be responsible for materials or substances brought to the site by the Contractor.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner ~~shall~~ shall, as soon as reasonably possible, obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the

Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. ~~By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.~~ Contractor may be entitled to an extension of the Contract Time in accordance with Article 8.3.

§ 10.3.3 ~~To the fullest extent permitted by law, extent permitted by the laws and Constitution of the State of Texas, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity. Notwithstanding anything to the contrary contained in this Section 10.3.3, the agreement of the Owner to indemnify, defend and hold harmless the parties described in this Section shall not extend or apply to claims, damages, losses, expenses or liabilities related to, created or caused in whole or in part by a party indemnified hereunder; it being agreed and understood that the Owner and any party so indemnified shall each bear liability for its own negligent acts or omissions, and that such indemnity shall extend only to liability for the negligent acts and omissions of the Owner.~~

§ 10.3.4 ~~The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.~~

§ 10.3.5 ~~The Contractor shall reimburse. Except to the extent that the cost and expense are due to the Owner's fault or negligence, if Contractor imports hazardous materials onto the Project site, the Contractor shall indemnify and hold harmless the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence. Section 10.3.1; and (3) any fines or penalties of government agencies directly resulting from the Contractor's importation of the hazardous materials onto the Project site.~~

§ 10.3.6 ~~If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred. [Paragraph Deleted.]~~

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~~In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.~~ **§ 10.4 .1** In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

§ 10.4.2 The performance of the foregoing services by the Contractor shall not relieve the subcontractors of their responsibility for the safety of persons and property and for compliance with all federal, state and local statutes, rules, regulations and orders of any governmental authority applicable to the conduct of the Work.

§ 10.5 Asbestos Or Asbestos-Containing Materials. Contractor shall submit to the Architect a written certification addressed to the Owner that all materials used in the construction of this Project contain less than 0.10% by weight of asbestos and for which it can be demonstrated that, under reasonably foreseeable job site conditions, will not release asbestos fibers in excess of 0.1 fibers per cubic centimeter. The written certification shall further state that, should asbestos fibers be found at this Project in concentrations greater than 0.1 fibers per cubic centimeter, then Contractor shall be responsible for determining which materials contain asbestos fibers and shall take all necessary corrective action to remove those materials from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor. Final Payment shall not be made until this written certification has been received.

§ 10.6 Lead-Free Material In Potable Water System

§ 10.6.1 Prior to payment of retainage and final payment, the Contractor and each subcontractor involved with the potable water system shall furnish a written certification that the potable water system is "lead-free".

§ 10.6.2 The written certification shall further state that should lead be found in the potable water system built under this Project, then Contractor shall be responsible for determining which materials contain lead and shall take all necessary corrective action to remove lead from the Project, at no additional cost to the Owner. The written certification shall be dated, shall reference this specific Project and shall be signed by not less than two (2) officers of the Contractor.

§ 10.7 Hazardous Materials Certification

The Contractor shall provide written certification that no materials used in the Work contain lead or asbestos materials in them in excess of amounts allowed by federal, state or local standards, laws, codes, rules and regulations; the Federal Environmental Protection Agency (EPA) standards; and/or the Federal Occupational Safety and Health Administration (OSHA) standards, whichever is most restrictive. The Contractor shall provide this written certification as part of submittals under the Section in the Project Manual related to Contract Closeout.

...

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor and the Contractor's Subcontractors shall purchase and maintain in force, insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the table below the Agreement or elsewhere in the Contract Documents. No Work will be commenced, and no equipment or materials may be shipped, until all requirements of Article 11 have been satisfied, satisfactory evidence of insurance has been provided, and all required insurance is in full force and effect. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents. State of Texas.

<u>Workmen's Compensation:</u> (Including Waiver of Subrogation Endorsement)	<u>All liability arising out of Contractor's employment of workers and anyone for whom Contractor shall be liable for Worker's Compensation claims. Worker's Compensation is required and no "alternative" form of insurance shall be permitted.</u>
<u>Employer's Liability:</u>	<u>\$1,000,000.00</u>

<u>Commercial General Liability:</u> <u>Each Occurrence</u> <u>General Aggregate</u> <u>Personal & Advertising Injury</u> <u>Products and Completed Operations</u>	<u>\$1,000,000.00</u> <u>\$2,000,000.00 (A Designated Construction Project</u> <u>General Aggregate Limit shall be provided)</u> <u>\$1,000,000.00 each person</u> <u>\$1,000,000.00 (for one (1) year, commencing with</u> <u>issuance of final Certificate for Payment)</u>
<u>Property Damage</u> <u>Independent Contractors</u> <u>Contractual Liability</u>	<u>\$1,000,000.00 each occurrence</u> <u>\$2,000,000.00 aggregate</u> <u>(Same limits as above)</u> <u>(Same limits as above)</u>
<u>Automobile Liability:</u> <u>Bodily Injury/Property Damage</u>	<u>\$1,000,000.00 combined single limit</u> <u>\$1,000,000.00 each occurrence</u>
<u>Umbrella or Excess Liability</u>	<u>\$5,000,000.00 each occurrence/aggregate</u>
<u>All Risk Builders Risk</u> against the perils of fire, lightning, windstorm, hurricane, hail, explosion, riot, civil commotion, smoke, aircraft, land vehicles, vandalism, malicious mischief, and all other perils in the amount one hundred percent (100%) of the value of the improvements including transit and materials stored off site. Additionally, this coverage shall provide protection to the full replacement value for boiler and machinery equipment up to installation, during testing, and until acceptance by Owner.	
<u>Professional Liability for Construction Manager-At-Risk.</u> <u>In addition to the coverage and limits provided above, if these General Conditions are incorporated into the AIA Document A133™–2019 Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price, the Construction Manager shall also provide Professional Liability Insurance covering negligent acts, errors and omissions in the performance of professional services during the pre-construction phase, with policy limits of not less than One Million Dollars (\$\$1,000,000.00) per claim and Two Million Dollars (\$\$2,000,000.00) in the aggregate.</u>	

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. required insurance must be written by a company licensed to do business in Texas at the time the policy is issued. In addition, the company must be acceptable to the Owner.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished. The General Liability and Automobile policies so issued in the name of Contractor shall also name the Owner as additional insured. The coverage afforded to the additional insured under the policy or policies shall be primary insurance. It is the intent of the parties to this Agreement that the General Liability coverage (and associated Umbrella Coverage) required herein shall be primary to and shall seek no contribution from all insurance available to Owner, with Owner's insurance being excess, secondary and non-contributing. The Commercial General Liability coverage provided by Contractor shall be endorsed to provide such primary and non-contributing liability. If the additional insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. ~~Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage. If the insurance is written with stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to~~

deductions in any payment made by the insurance carrier on claims paid by this insurance. If the Owner is damaged by the failure of the Contractor to maintain such insurance and to so notify the Owner then the Contractor shall bear all reasonable costs properly attributable thereto.

§ 11.1.5 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. Nothing contained herein shall limit or waive Contractor's legal or contractual responsibilities to Owner or others.

§ 11.1.6 Contractor shall have its insurance carrier(s) furnish to Owner insurance certificates in form satisfactory to Owner specifying the types and amounts of coverage in effect, the expiration dates of each policy, and a statement that no insurance will be canceled or materially changed while the Work is in progress without thirty (30) calendar day's prior written notice to Owner. Contractor shall permit Owner to examine the insurance policies, or at Owner's option, Contractor shall furnish Owner with copies, certified by the carrier(s), of insurance policies required in Section 11.1.1. If Contractor neglects or refuses to provide any insurance required herein, or if any insurance is canceled, Owner may, but shall not be obligated to, procure such insurance and the provisions of Section 11.1.8 hereof shall apply.

§ 11.1.7 Contractor and its Subcontractors shall not commence the shipment of equipment or materials or commence the Work at the site until all of the insurance coverage required of Contractor and its Subcontractors are in force and the necessary certificates and statements pursuant to Section 11.1.6 hereof have been received by Owner and the Architect has issued a written notice to proceed.

§ 11.1.8 As an alternative and at Owner's option and expense, Owner may elect to furnish or to arrange for any part or all of the insurance required by Section 11.1 hereof. If Owner so elects, it shall notify, in writing, Contractor and issue a Change Order therefor, but no adjustment to the scheduled completion date or the Contract Sum shall be allowed.

§ 11.1.9 Workers' Compensation Insurance Coverage.

.1 Definitions:

.1.1 Certificate of coverage ("Certificate"). A copy of a certificate of insurance, a certificate of authority to self-insure issued by the division, or a coverage agreement (DWC Form-81, DWC Form-82, DWC Form-83, or DWC Form-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on the Project, for the duration of the Project.

.1.2 Duration of the Project. Includes the time from the beginning of the work on the Project until the Contractor's work on the Project has been completed and accepted by the Owner.

.1.3 Persons providing services on the Project ("subcontractor" in Texas Labor Code §406.096). Includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person contracts directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the Project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. "Services" does not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

.2 The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the Project, for the duration of the Project.

.3 The Contractor must provide a certificate of coverage to the Owner prior to being awarded the contract.

.4 If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the Owner showing that coverage has been extended.

- .5 The Contractor shall obtain from each person providing Services on a Project, and provide to the Owner:
- .5.1 a certificate of coverage, prior to that person beginning work on the Project, so the Owner will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
- .5.2 no later than seven (7) days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.
- .6 The Contractor shall retain all required certificates of coverage for the duration of the Project and for one (1) year thereafter.
- .7 The Contractor shall notify the Owner in writing by certified mail or personal delivery, within ten (10) days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.
- .8 The Contractor shall post on each Project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.
- .9 The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:
- .9.1 provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the Project, for the duration of the Project;
- .9.2 provide to the Contractor, prior to that person beginning work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project, for the duration of the Project;
- .9.3 provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
- .9.4 obtain from each other person with whom it contracts, and provide to the Contractor:
- (a) a certificate of coverage, prior to the other person beginning work on the Project; and
- (b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
- .9.5 retain all required certificates of coverage on file for the duration of the Project and for one (1) year thereafter;
- .9.6 notify the Owner in writing by certified mail or personal delivery, within ten (10) days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
- .9.7 contractually require each person with whom it contracts, to perform as required by Subparagraphs .9.1 - .9.7 with the certificates of coverage to be provided to the person for whom they are providing services.
- .10 By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the Owner that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the Texas Department of Insurance, Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.
- .11 The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the Owner to declare the contract void if the Contractor does not remedy the breach within ten (10) days after receipt of notice of breach from the Owner. [28 TAC §110.110(c)(7)]

§ 11.1.10 The Owner and Contractor shall waive all rights against (1) each other and the Contractors, Subcontractors, agents and employees each of the other, and (2) the Architect and separate Contractors, if any, and their contractors, Subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property

insurance applicable to the Work. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by Section 3.18.3. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, contractors and Subcontractors by appropriate agreements, written where legally required for validity, similar waivers, each in favor of all other parties enumerated in this Section 11.1.10.

§ 11.2 Owner's Insurance [Paragraph Deleted.]

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation [Paragraph Deleted.]

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§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PERFORMANCE BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum.

§ 11.4.2 The Contractor is required, as a condition precedent to the execution of the Contract, to execute a PAYMENT BOND in the form required by TEXAS STATUTES, in an amount equal to ONE HUNDRED PERCENT (100%) of the Contract Sum as security for payment of all persons performing labor and furnishing materials in connection with this Contract. (Bonding Company is to furnish such forms). All bonds shall name the Owner as additional obligee.

§ 11.4.3 The Payment and Performance Bond shall meet requirements of Chapter 2253 of the Texas Governmental Code. All bonds shall be issued by a surety company licensed, listed and authorized to issue bonds in the State of Texas by the Texas Department of Insurance. The surety company may be required by the Owner to have a rating of not less than "B" in the latest edition of Best's Insurance Reports, Property-Casualty. The surety company shall provide, if requested, information on bonding capacity, other projects under coverage and shall provide proof to establish adequate financial capacity for this Project. Should the bond amount be in excess of ten percent (10%) of the surety company's capital and surplus, the surety company issuing the bond shall certify that the surety company has acquired reinsurance, in a form and amount acceptable to the Owner, to reinsure the portion of the risk that exceeds ten percent (10%) of the surety company's capital and surplus with one or more reinsurers who are duly authorized and admitted to do business in Texas and that amount reinsured by an reinsurer does not exceed ten percent (10%) of the reinsurer's capital and surplus.

§ 11.4.4 The Sureties shall promptly file a signed copy of the Contract, Performance Bond, and Payment Bond with the Owner in full compliance with Chapter 2253 of the Texas Governmental Code or, in the case of a Construction Manager, as required by Section 14.3.3 of the AIA Document A133-2019.

§ 11.4.5 All bonds will be reviewed by the Architect for compliance with the Contract Documents prior to execution of the contract. In the event that the Architect has any questions concerning the sufficiency of the bonds, the bonds will be referred to the Owner or the Owner's representative for review and decision.

§ 11.4.6 All bonds shall be originals. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power-of-Attorney. The name, address, and telephone number of a contact person for the bonding company shall be provided.

§ 11.4.7 Upon the request in writing of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the contract, the Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

§ 11.4.8 Bonds shall be signed by an agent resident in the State of Texas and the date of the bond shall be the date of execution of the contract. If at any time during the continuance of the contract, the surety of the Contractor's bonds becomes insufficient, Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) business days after notice to do so. In default thereof, the Contractor may be suspended, and all payment or money due to the Contractor withheld.

§ 11.4.9 By inclusion of this Section 11.4.8 in the Contract Documents, the surety which issues the bonds is hereby notified that the Owner, the Architect, and their agents and employees do not represent and will not be responsible for the surety's interests during the course of the Work. To protect its interests, the surety shall have the right to attend pay estimate meetings, review Applications for Payment when requested in writing by them, comment upon and make recommendations regarding payments, and inspect the Work in the presence of the Contractor and the Architect. By providing the bonds for the Work, the surety shall and hereby waives any cause of action against the Owner, the Architect, their agents and employees, for any loss suffered by the surety by reason of overpayment of any amounts to the Contractor, unless such is a direct result of a fraudulent or grossly negligent act committed by such party.

§11.5 Adjustment and Settlement of Insured Loss [Paragraph Deleted.]

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt

of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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§ 12.1.1 If a portion of the Work is covered prior to inspection, contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, Documents or if any known deficiencies exist, it must, if requested in writing by the Architect, be uncovered by the Contractor for the Architect's examination and be replaced at the Contractor's sole expense without change in the Contract Time. If the uncovered work is determined by the Architect upon inspection to be deficient or not in accordance with the Contract Documents, the uncovered Work which is deficient or not in accordance with the Contract Documents shall be corrected and covered at the Contractor's sole expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense. If the a request inspection of the Work prior to covering or including a requirement for inspection in the Contract Documents is within the Architect's standard of care and the Architect has failed to timely make such request or include the requirement in the Contract Documents, the Architect shall reimburse the Owner for the actual costs of uncovering and recovering such Work and additional costs of correction, if any, caused by covering the Work prior to inspection.

...

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's ~~expense~~ and will be subject to offset by the Owner at Final Payment.

...

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Owner shall give such notice of the condition to the Contractor with reasonable promptness after discovery of the condition. The Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. ~~The Owner shall give such notice promptly after discovery of the condition.~~ condition in its non-conforming state. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor ~~and to make a claim for breach of warranty.~~ based on a breach of the warranty contained in this Section 12.2.2.1 providing for correction of Work during the one-year period. If the Contractor fails to correct nonconforming Work within a reasonable time during ~~that the~~ period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

...

§ 12.2.2.3 The one-year period for correction of Work shall ~~not~~ be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.2.4 Upon request by the Owner and prior to the expiration of one (1) year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

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§ 12.2.6 Contractor shall (i) re-execute any parts of the Work that fail to conform with the requirements of this Agreement that appear during the progress of the Work; (ii) remedy any defects in the Work due to faulty materials or workmanship which appear within a period of one (1) year from Substantial Completion of the Work hereunder, or within such longer period of time as may be set forth in the Drawings and Specifications or other Contract Documents; and (iii) replace, repair, or restore any parts of the Project or furniture, fixtures, equipment, or other items placed therein (whether by Owner or any other party) that are injured or damaged by any such parts of the Work that do not conform to the requirements of the Contract Documents or defects in the Work or by the negligent act of the Contractor or its employees, agents or subcontractors. The cost to Contractor of performing any of its obligations under this Section 12.2.6 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.7 The provisions of this Section 12.2 apply to Work done by Subcontractors of the Contractor as well as Work done directly by employees of the Contractor. The provisions of this Section 12.2.7 shall not apply to corrective Work attributable solely to the acts or omissions of any separate Contractor of Owner (unless Contractor is acting in such capacities). The cost to Contractor of performing any of its obligations under this Section 12.2.7 to the extent not covered by insurance shall be borne by Contractor.

§ 12.2.8 If, however, Owner and Contractor deem it inexpedient to require the correction of Work damaged or not done in accordance with the Contract Documents, an equitable deduction from the Contract Sum shall be made by written agreement between Contractor and Owner. Until such settlement, Owner may withhold such sums as Owner deems just and reasonable from moneys, if any, due Contractor. The settlement shall not be unreasonably delayed by the Owner and the amount of money withheld shall be based on estimated actual cost to the Owner of the correction.

§ 12.2.9 Contractor's express warranties set out in this Article 12 shall be in addition to, and not in lieu of, any other warranties or remedies Owner may have under the Contract Documents, at law, or in equity for defective Work.

...

~~The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4. laws of the State of Texas without regard to choice-of-law rules of any jurisdiction. The Contract is deemed performable entirely in the County in which the Project is located. Any litigation to enforce or interpret any terms of the Contract, or any other litigation arising out of or as a result of the Contract, shall be brought in the State courts of said County. No provision of this Agreement shall waive any immunity or defense.~~

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§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. ~~Except as provided in Section 13.2.2, neither~~ Neither party to the Contract shall assign the Contract as a whole in whole or in part without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender or other entity providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.2.3 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability, or effect of the remainder of the Contract Documents.

...

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made at appropriate times as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. authorities having jurisdiction. Except for tests, inspections and approvals required to be provided by the Contractor in the Contract Documents, the Owner will contract for, independently of the Contractor, the inspection services, the testing of construction materials engineering, and the verification testing services necessary for the acceptance of the Work by the Owner. The Contractor shall give timely notice to the persons or entities selected by the Owner of the need for such services. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense. Architect, Owner and Contractor shall cooperate for the timely scheduling of such tests and inspections.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including but not limited to those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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~~Payments~~ Undisputed payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located. in accordance with the Texas Prompt Payment Act, Texas Gov't Code Chapter 2251. Any such payment shall be deemed overdue on the thirty-first (31st) day after Owner receives the Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets more than once per month. Any such payment shall be deemed overdue on the forty-sixth (46th) day after Owner receives the Contractor's Certificate for Payment from the Architect, if Owner's Board of Trustees meets once a month or less frequently. No interest shall be due on sums properly retained by Owner, except as provided by law, or on disputed sums unpaid by Owner.

§ 13.6 Equal Opportunity In Employment

§ 13.6.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, age, disability, sex, national origin, or any class otherwise protected by District policy or law. The Contractor agrees to post in conspicuous places, available to employees and applicants, notices setting forth the Contractor's nondiscrimination policies.

§ 13.6.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, age, disability, sex, national origin, or any class otherwise protected by District policy or law.

§ 13.7 Contractors Records

§ 13.7.1 Contractor agrees to furnish Owner such information as may be available in Contractor's files and records for the Project for the purpose of aiding Owner in establishing a depreciation schedule for the Project or such portions thereof as Owner may determine.

§ 13.7.2 Contractor shall at all times through the date of Final Completion, maintain Job Records, including, but not limited to, invoices, payment records, payroll record, daily reports, diaries, logs, instructions, drawings, receipts, contracts, purchase orders, vouchers, memoranda, other financial data and job meeting minutes applicable to the Project, in a manner which maintains the integrity of the documents. Job Records must be retained by Contractor for at least twelve (12) years after the date of Final Completion of the Project. Within ten (10) days of Owner's request, Contractor shall make such Job Records available for inspection, copying and auditing by the Owner, Architect or their respective representatives, at Owner's central office or the principal offices of the Contractor, at the sole option of the Owner.

§ 13.7.3 For all Change Orders, Allowances and expenditures from Contingency Funds, Contractor shall also maintain, in accordance with the provisions of Section 13.9.1, the following: contract files, including proposals of successful and unsuccessful bidders, bid recaps and contractor payments; original estimates; estimating Work sheets; general ledger entries detail cash and trade discounts received; insurance rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges related to the Contract.

§ 13.7.4 Contractor shall keep a full and detailed financial accounting system and shall exercise such controls as may be necessary for proper financial management under this Contract; the accounting and control system shall be satisfactory to the Owner and shall be subject to the provisions of Section 13.7.1.

§ 13.7.5 Contractor shall keep all Construction Documents related to the Project, provided, however, Contractor shall not destroy said documents until Contractor has confirmed with Owner in writing that Owner has obtained a copy of all as-built drawings.

§ 13.7.6 In the event that an audit by the Owner reveals any errors/overpayments by the Owner, then the Contractor shall refund to the Owner the full amount of such overpayment within thirty (30) days of such audit findings, or the Owner, as its option, reserves the right to deduct such amounts owed to the Owner from any payments due to the Contractor.

§ 13.8 No Third-Party Beneficiaries

There are no third-party beneficiaries to this agreement.

§ 13.9 Proprietary Interests And Confidential Information

§ 13.9.1 Neither Architect nor Contractor shall use the image or likeness of Owner's Project or Owner's official logo or emblem and any other trademark, service mark, or copyrighted or otherwise protected information of Owner, without Owner's prior written consent. Contractor and Architect shall not have any authority to advertise or claim that Owner endorses Architect or Contractor's services, without Owner's prior written consent.

§ 13.9.2 Neither Architect nor Contractor shall disclose any confidential information of Owner which comes into the possession of Architect or Contractor at any time during the Project, including but not limited to: pending real estate purchases, exchange, lease, or value; information related to litigation; detailed layouts of the Owner's Facilities; the location and deployment of security devices; security access codes; student likenesses; student record information; employee information; or any other information deemed confidential by law.

§ 13.9.3 The parties acknowledge that, as a public entity in the State of Texas, Owner is subject to, and must comply with, the provisions of the Texas Public Information Act, Texas Government Code Section 552.001, *et seq.*, and the Texas Open Meetings Act, Texas Government Code, Section 551.001, *et seq.*

§ 13.10 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever the validity, enforceability or effect of the remainder of the Contract Documents.

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§ 14.1.1 The Contractor may terminate the Contract if If the Work is stopped for a period of 30 thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons: the Work under direct or indirect contract with the Contractor for any of the reasons set forth below, the Contractor may terminate the Contract upon twenty (20) days written notice to Owner and Architect if the Work is not allowed to commence within such period. The sole grounds for termination under this Subsection 14.1.1 are as follows:

- ...
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a of undisputed sums due on an approved Certificate for Payment within the time stated in the Contract Documents; or
 - .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2. [Subsection Deleted.]

§ 14.1.2 ~~The Contractor may terminate the Contract if,~~ If through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less, ~~less, the Contractor may terminate the Contract so long as Contractor has provided Owner and Architect with written notice of its intent to terminate in the event of additional delays of not less than twenty (20) days and has furnished written notice of termination to Owner and Architect no less than seven (7) days prior to the effective date of termination.~~

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination, in an amount which would have been recoverable had the termination been for the Owner's convenience.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon ~~seven~~ten (10) additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

...

- .2 fails to make payment to Subcontractors or suppliers for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

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- .4 ~~fails to proceed continuously and diligently with the construction and completion of the Work; except as permitted under the Contract Documents;~~
- .5 fails to furnish the Owner, upon written request, with assurances satisfactory to the Owner, evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;
- .6 engages in or permits serious or repeated worker misconduct in violation of Article 3.3;
- .7 engages in conduct that would constitute a violation of state or federal criminal law, including but not limited to, the laws prohibiting certain gifts to public servants, or engages in conduct that would constitute a violation of the Owner's ethics or conflict of interest policies; or
- .8 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, ~~and upon certification by the Architect that sufficient cause exists to justify such action, subject to any prior rights of the surety,~~ the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

...

- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. ~~Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.~~

In any such event, title to the Work and any products thereof, whether completed or partially completed, as well as all materials prepared, procured or set aside by the Contractor for use in the Work, shall vest in the Owner at the Owner's option, and the Owner may enter the Contractor's premises and remove the same therefrom. No election hereunder shall be construed as a waiver of any rights or remedies of the Owner with regard to any breach of the Contract Documents.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. Any further payment shall be limited to amounts actually earned to the date of termination.

§ 14.2.4 ~~If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's Architects' services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor exceed the unpaid balance of the Contract Sum or Guaranteed Maximum Price (if the Project is a Construction Manager at Risk project), then the Contractor and/or its Surety shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this Owner shall be certified by Architect upon application. The obligation for payment shall survive termination of the Contract.~~

§ 14.2.5 The parties hereby agree that: 1) if an order for relief is entered on behalf of the Contractor, pursuant to Chapter 11 of the U.S. Bankruptcy Code; 2) if any other similar order is entered under any debtor relief laws; 3) if Contractor makes an assignment for the benefit of one or more of its creditors; 4) if a receiver is appointed for the benefit of its creditors; or 5) if a receiver is appointed on account of its insolvency, any such event could impair or frustrate Contractor's performance of the Contract Documents. Accordingly, it is agreed that upon occurrence of any such event, Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of the Contract Documents. Failure to comply with such request within ten (10) days of delivery of the request shall entitle Owner to terminate the Contract and to the accompanying rights set forth in Subparagraphs 14.2.1 through 14.2.6. In all events, pending receipt of adequate assurance of performance and actual performance in accordance with the Contract Documents, Owner shall be entitled to proceed with the Work with Owner's own forces or with other Contractors on a time and material or other appropriate basis, the cost of which will be charged against the Contract Sum.

§ 14.2.6 As required by Texas Government Code Chapter 2253, if a Performance Bond has been furnished and the Contractor is declared by the Owner to be in default under the Contract, then the Surety shall promptly perform the Work, in full accordance with the plans, specifications and Contract Documents. Unless otherwise agreed in writing between the Surety and the Owner, the Surety shall complete the Work by the Surety entering into a Contract acceptable to Owner, with a Contractor acceptable to Owner, and shall obtain new Payment and Performance Bonds as required by law.

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§ 14.3.2 ~~The Contract Sum and Contract Time shall may be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent~~

...

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. Furthermore, if this Contract is a multi-year contract funded through Owner's current general funds that are not bond funds, then the Owner's Board of Trustees has the right to not appropriate adequate monies for the next fiscal year and to terminate this Contract at the end of each fiscal year during the term of the Contract, without the Owner incurring any further liability to Contractor as a result of such termination.

...

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement executed, for profit only on that portion of the Work executed, and reasonable costs of demobilization.

§ 14.4.4 Upon determination by a Court of competent jurisdiction that termination of the Contractor pursuant to Section 14.2 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Section 14.4, and Contractor's remedy for wrongful termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in this Section 14.4.3.

...

§ 15.1.2 Time Limits on Claims

~~The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.~~ [Paragraph Deleted.]

...

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party Owner and to the Architect, Claims under this Section 15.1.3.1 shall be initiated within 21 calendar days after the occurrence of the event giving rise to such Claim or within 21 calendar days after the claimant first recognizes knew or should have known of the condition giving rise to the Claim, whichever is later is earlier. If the full impact cannot be assessed as of the date of the Notice, then Notice shall be provided and amended by a second notice at the earliest date that is reasonably possible, but in no event later than the date of Contractor's Application for Payment covering the period in which the impact can be assessed and quantified.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required. If Texas Government Code, Chapter 2272 is applicable to the Claim, the Owner shall comply with the requirements set out therein as a condition precedent to any initiation of any litigation.

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§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make undisputed payments for Work performed in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum (or Guaranteed Maximum Price, as applicable), if permitted, and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party the Contractor to proceed in accordance with this Article 15. ~~The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.~~

...

If the Contractor wishes to make a Claim for an increase in the Contract Sum, Sum (provided such a claim is specifically permitted by the Contract Documents), notice as provided in Section 15.1.3 shall be given to the Owner and Architect, before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. The Architect will promptly investigate such Claim and report findings and a recommended resolution in writing to the Owner and Contractor. If the Claim is approved by Owner, then Contractor shall proceed with the execution of the Work that is

the subject matter of the Claim. If the Claim is rejected by the Owner, then Contractor may pursue alternative dispute resolution as provided for in the Contract Documents.

...

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is ~~necessary~~. **§ 15.1.6.2** If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions occurred at the locality of the Work which were abnormal for the period of time, were in excess of that normally experienced at the job site, could not have been reasonably anticipated, and prevented the execution of Work on scheduled Working Days. The term "Adverse Weather Conditions" as used herein means unusually severe weather which is beyond the normal weather recorded and expected for the locality of the Work and/or the season or seasons of the year. Normal weather conditions shall be determined based upon information compiled from the Local Climatological Data maintained by NOAA's National Centers for Environmental Information [formerly the National Climatic Data Center (NCDC)] from the station closest to the location of the Work. No day will be counted as a rain-day when substantial Contractor forces are able to perform Work on the Project for more than fifty percent (50%) of the usual workday or when the stage of the Work on the Project is not adversely impacted. The Contractor shall bear the entire economic risk of all weather delays and disruptions, and shall not be entitled to any increase in the Contract Price by reason of such delays or disruptions. Requests for an extension of the Contract Time pursuant to this Subparagraph shall be submitted to the Architect not later than the fifteenth (15th) day of the month following the month during which the delays or disruptions occurred, but shall be applied only to the extent that Substantial Completion of the Project exceeds the Substantial Completion date established for the Work. As provided herein, Contractor shall only be entitled an extension of the Contract Time per the terms of the Contract Documents and no damages shall be paid for delays.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.1.7 Calculating Claims For Damages

Except as otherwise provided in this Agreement, in calculating the amount of any Claim recoverable by the Contractor, the following standards will apply:

- .1 No indirect or consequential damages will be allowed.
- .2 No recovery shall be based on a comparison of planned expenditures to total actual expenditures, or on estimated loss of labor efficiency, or on a comparison of planned manloading to actual manloading, or any other analysis that is used to show damages indirectly.
- .3 Damages are limited to extra costs specifically shown to have been directly caused by a proven wrong.
- .4 No damages will be allowed for home office overhead or other home office changes or any Eichlay formula calculation.

Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents, nor will this Section 15.1.7 be deemed to apply to delay damages, which are prohibited entirely.

§ 15.2.1 ~~Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision Claims by the Contractor against the Owner, including those alleging an error or omission by the Architect but excluding those arising under Section 10.3, shall be referred initially to the Architect for consideration and recommendation to the Owner. An initial recommendation by the Architect shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days Claim, after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.~~ Architect with no recommendation having been rendered by the Architect.

§ 15.2.2 ~~The Initial Decision Maker Architect will review Claims and within ten (10) days of the receipt of a the Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.~~ Contractor; (2) issue an initial recommendation; (3) suggest a compromise; or (4) advise the parties that the Architect is unable to issue an initial recommendation due to a lack of sufficient information or conflict of interest.

§ 15.2.3 ~~In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense. Following receipt of the Architect's initial recommendation regarding a claim, the Owner and Contractor shall attempt to reach agreement as to any adjustment to the Contract Price and/or Contract Time. If no agreement can be reached either party may request mediation of the dispute pursuant to Article 15.~~

§ 15.2.4 ~~If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.~~

§ 15.2.5 ~~The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~ [Paragraph Deleted.]

§ 15.2.6 ~~Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~ [Paragraph Deleted.]

§ 15.2.6.1 ~~Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.~~ [Paragraph Deleted.]

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§ 15.2.8 ~~If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.~~ **Waiver Of Lien**

It is distinctly understood that by virtue of this Contract, no mechanic, contractor, materialman, artisan, or laborer, whether skilled or unskilled, shall ever in any manner have, claim, or acquire any lien upon the building, or any of the improvements of whatever nature or kind so erected or to be erected by virtue of this Contract nor upon any of the land upon which said building or any of the improvements are so erected, built, or situated.

...

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution. In the event that the Owner or the Contractor shall contend that the other has committed a material breach of this Agreement, the party alleging such breach shall, as a condition precedent to filing any lawsuit, request mediation of the dispute. Mediation shall be subject to and in accordance with Chapter 154 of the Texas Civil Practice & Remedies Code. Mediation shall be conducted by a mutually-agreed-upon mediator qualified as an impartial third party for purposes of Section 154.052 of the Texas Civil Practice & Remedies Code.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings. Request for mediation shall be in writing, and shall request that the mediation commence not less than thirty (30) or more than ninety (90) days following the date of the request, except upon agreement of both parties.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision. In the event the Owner and the Contractor are unable to agree to a date for the mediation or to the identity of the mediator or mediators within thirty (30) days following the date of the request for mediation, all conditions precedent in this article shall be deemed to have occurred.

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§ 15.3.5 Nothing herein shall preclude the Owner or the Contractor or as applicable, the Construction Manager from requesting that the Architect or one or more subcontractors be joined as parties to the mediation, to the extent allowed by their respective contracts.

§ 15.3.6 Any claim not resolved in mediation pursuant to Section 15.3 shall be subject to litigation as the sole method of dispute resolution.

§ 15.3.7 Unless otherwise agreed in writing by the Owner in the Owner's sole discretion, the Contractor may not bring a legal action against the Owner unless:

- .1 the Contractor has given written notice to the Owner of the Claim, dispute, or other matter giving rise to the legal action within ninety-one (91) days after the date of the start of the event giving rise to the Contractor's Claim, dispute or other matter, and
- .2 the legal action is brought within two (2) years and one (1) day after the date of the start of the event giving rise to Contractor's Claim, dispute or other matter.

§ 15.4 Arbitration. This Section 15.4 and all subparts are intentionally deleted. No dispute arising under the Contract Documents, these General Conditions or the underlying Contract shall be subject under any circumstances to Arbitration as the method of binding dispute resolution and Owner rejects any selection otherwise made by the parties.

§ 15.5 Immunity

Contractor stipulates that Owner is a political subdivision of the State of Texas and, as such, may enjoy immunities from suit and liability under the Constitution and laws of the State of Texas. By entering into this Agreement, Owner

does not waive any of its immunities from suit and/or liability, except as otherwise specifically provided herein and as specifically provided by law.

Executed on this the _____ day of _____, 20____.

MIDLOTHIANINDEPENDENT SCHOOL DISTRICT		_____
OWNER <i>(Signature)</i>		CONTRACTOR <i>(Signature)</i>
Dr. Jo Ann Fey, Superintendent of Schools <i>(Printed name and title)</i>		<i>(Printed name and title)</i>

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Elisabeth Nelson, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 13:51:30 ET on 10/01/2021 under Order No. 5048698191 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

SECTION 01 1100

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project: Midlothian ISD Stadium Additions and Renovations located at 1800 S 14th Street, Midlothian, Texas 76065.
- B. Base Bid: Construct Improvements to Midlothian ISD Multi-Purpose Stadium. The Base Bid shall include labor, material, equipment, services and transportation necessary to complete all work as described in the Construction Documents. The work shall include utility connections and other work indicated, or reasonably implied, unless specifically indicated "Not in Contract."
- C. The Contractor shall be responsible for any and all existing structures and/or improvements, both above and underground, including the finishes thereof (both interior and exterior) within the adjoining working areas, and shall provide adequate protection therefore, either by barricades, or coverings, or by temporary removal. Any existing structures and/or improvements damaged during construction shall be repaired and/or replaced with materials, workmanship, fixtures or equipment of the same kind, quality and size as required by the Drawings or specifications. Any materials or equipment temporarily removed and damaged shall be repaired or replaced and re-erected or installed in an approved manner.
- D. Scaffold, Staging, Protection, etc.: The Work under each Section of these Specifications shall include providing, installing, and maintaining all scaffold, staging, trestles, and planking necessary for the work under each Section in strict conformity with all applicable laws and ordinances, and maintenance of same so as not to interfere with or obstruct the work of other trades. Additionally, the work under each section of these Specifications shall include providing all forms of protection necessary to preserve the work of other trades free from damage. These provisions shall be considered as though repeated under each separate Section of the Specifications.
- E. Asbestos: It is the intent and requirement of these Contract Documents that no asbestos is to be used or incorporated into this Project in any form. If asbestos in any form is incorporated into the construction and is subsequently found during the construction period or after occupancy, it shall be the Contractor's responsibility to remove it immediately and replace it with materials approved by the Architect, including repair of all damage to adjacent materials caused by the asbestos removal, at the Contractor's expense. The period for discovery of materials containing asbestos shall not be limited by warranty period contained within this Contract or otherwise provided with the materials or construction. At close-out, the Contractor shall complete the affidavit in Section 01 7700, Closeout Procedures, on behalf of himself, his subcontractors and his suppliers, certifying that materials used or installed in the project are asbestos free.
- F. Time for Completion: The Contractor shall complete the Work within the limits of the Contract.

- G. Utilities:
1. Utilities, services, etc., cut or damaged by the Work shall be the Contractor's responsibility for repair and/or replacement in accordance with governing authority's requirements.
 2. Contractor shall obtain written approval from the Owner a minimum of 72 hours prior to disconnection or shutting off service or utility.
- H. Accessibility of Systems: No equipment which must be operated or maintained, such as valves, taps, controls, unions, motors, etc., shall be placed in an inaccessible location.
1. Dampers, filters, controls, valves, expansion joints, electrical junction boxes, air handling units or filters, or other apparatus that must be located in walls, above ceilings, etc., shall be provided with suitable access doors (fitted in a framed opening) that will permit proper operation, servicing and access. The access door shall be fire rated where required to maintain the fire rating of the wall or ceiling.
 2. Exhaust fans, fan coil units, VAV boxes or other air handling equipment shall not be located above hard ceiling areas. Piping, fan covers, etc. shall be arranged to allow easy access to filters or other parts that may need maintenance. Valves, etc., shall be grouped to minimize the number of access panels required.
 3. Filters, valves, traps, controls, etc., that require periodic maintenance and whose removal would cause adverse consequences to occupants, equipment or critical operations shall be supplied with manual bypasses whenever practical.
- I. Construction Staking: Unless noted otherwise, the Contractor shall be responsible for employing the services of a licensed surveyor to provide all necessary surveying and staking required for construction of the Work.

1.2 CONTRACTOR USE OF PREMISES

- A. Contractor's parking, access, yards, etc., shall be limited to those areas on the site or as specifically indicated at the Pre-Bid or Pre-Construction Conferences.
- B. Contractor and other persons connected to this Project shall only use parking areas designated on site plan or as approved by the Owner.
- C. Contractor and workmen shall not trespass into area beyond the "Limit of Work" area.
- D. Contractor shall use and maintain in clean condition site access route as shown on site or site access plan. No other access shall be used for vehicles or personnel.
- E. Portions of the Project site will be in use by the Owner during the construction period and the Contractor shall make every effort to minimize disruption of on-going operations, including necessary safety and security at the construction site. Appropriate safety and security measures shall be the responsibility of the Contractor.

1.3 OCCUPANCY REQUIREMENTS

- A. The Owner may request that certain portions of the work be completed and occupied while remaining contract Work is still in progress. After consideration of the Contractor's schedule, such a request may be granted even if it may require that more concentrated work be done in the area(s) to be occupied early. When this occurs, the occupancy of such areas, and the moving of furnishings and equipment into the area by the owner, shall not constitute acceptance of the Work performed under this contract, nor shall it be equivalent to receiving a Certificate of Substantial Completion for the work in this contract.

- B. The Contractor shall be held harmless for damage to the work caused by the Owner by early occupancy of the Owner.
- C. The Contractor shall make available, in the areas occupied, utility services, heating and cooling as are in condition to be put in operation at the time of early occupancy. Responsibility for said equipment shall remain with the Contractor while it is so operated. However, an itemized list of each piece of equipment so operated, with the date operation commences, shall be made and certified by the Architect. The Owner shall pay for utility costs that arise out of the occupancy by the Owner during construction except for telephone services that the Contractor shall provide.

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 GENERAL

1.1 ALLOWANCES: The Cash Allowances indicated in this section shall be included in the Base Bid.

1.2 Unless otherwise provided in the Contract Documents:

- A. Allowances shall include the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance shall be included in the Contract Sum, but not in the Allowances.
- B. Whenever costs are more or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order.

Item No. 1: Allow the sum of \$100,000.00 as a Contingency amount to be used for the correction of existing concealed conditions.

Item No. 2: Allow the sum of \$5,000.00 for providing interior signage as specified.

Item No. 3: Allow the sum of \$5,000.00 for providing exterior signage as specified.

END OF SECTION

SECTION 01 2200

UNIT PRICES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section provides the administrative and procedural requirements for unit prices.
 - 1. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.
 - 2. Unit prices include all necessary material, overhead, profit and applicable taxes.
- B. A Unit Price Schedule is included at the end of this Section.
 - 1. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

3.1 UNIT PRICES

- A. All unit prices shall include all costs for labor, material, disposal, machinery, equipment, overhead, profit, etc. necessary to properly and fully perform the work in accordance with the Contract Documents.

3.2 UNIT PRICE SCHEDULE

- A. Concrete Piers:
Per linear. ft. Add \$ _____
Deduct \$ _____

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1 GENERAL

- 1.1 ALTERNATE BIDS: Contractor shall state, in the spaces provided in the Form of Proposal, Alternate Prices for the Work described below. The responsibility of determining quantity of Alternates rests with the Contractor. Base Bid and Alternates shall include cost of all supporting elements required so that no matter which combination of Base Bid and Alternate Bids are accepted, the portion shall be a complete entity in itself. Work for Alternate Bids shall be in strict accordance with applicable Specifications.

ALTERNATE NO. 1 (ADD or DEDUCT) Provide and Install as Alternate No. 1 - Stadium Concrete and Fencing Repairs:

Alternate No. 1 will consist of repairing the cracking of the concrete wall panels in multiple locations as well as minor fencing repairs required. The interior concrete wall panels will also be re-painted and is identified in the Architectural Drawings.

ALTERNATE NO. 2 (ADD or DEDUCT) Provide and Install as Alternate No. 2 - Stadium Bleachers and Restroom Renovations:

Alternate No. 2 will consist of constructing concrete stadium bleachers with approximately 600 aluminum bleachers seats. Two (2) water closets and one wall lavatory will be added to all four concession buildings at the Women's Toilets and one urinal and one wall lavatory will be added to all four concession buildings at the Men's Toilets. All toilet rooms will be painted to match existing conditions

ALTERNATE NO. 3 (ADD or DEDUCT) Provide and Install as Alternate No.03 - Press Box Control Room:

Alternate No. 3 will consist of the construction of a control room at the Concourse Level of the Press Box as shown in the Construction Documents. This work will include power, lights, HVAC, finishes, etc.

ALTERNATE NO. 4 (ADD or DEDUCT) Provide and Install as Alternate No. 4 - Straight Shaft Piers at the Athletic Office Building:

Alternate No. 4 will consist of straight shaft piers to be in tan limestone in lieu of grey. Indicating 10 ft of penetration (end bearing 12 ksf, skin 1.8 ksf).

ALTERNATE NO. 5 (ADD or DEDUCT) Provide and Install as Alternate No. 5. Moisture Conditioning of the soil at the Athletic Office Building:

Alternate No. 5 will consist of 6 ft of moisture conditioning with 2 ft select fill cap. Additionally we will need an add/deduct for cubic ft of moisture conditioned onsite soils.

ALTERNATE NO. 6 (ADD or DEDUCT) Provide and Install as Alternate No. 6 - Shallow Foundation at the Athletic Office Building.

Alternate No. 6 will consist of no piers and use shallow foundations bearing on the moisture condition soils with 2,000 psf bearing.

END OF SECTION

SECTION 01 2613

CONTRACTOR'S REQUEST FOR INTERPRETATION (RFI)

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Administrative requirements for Requests For Interpretation.

1.2 DEFINITIONS

- A. Request for Interpretation:
 - 1. A document submitted by the Contractor requesting interpretation of a portion of the Contract Documents, hereinafter referred to as RFI.
 - 2. A properly prepared Request for Interpretation shall include a detailed written statement that indicates the specific Drawings or Specification in need of clarification and the nature of the clarification requested.
 - a. Drawings shall be identified by drawing number and location on the drawing sheet.
 - b. Specifications shall be identified by Section number, page and paragraph.
- B. Improper or frivolous RFI's:
 - 1. RFI's that request information that is clearly shown on the Contract Documents.
 - 2. RFI's that are not properly prepared or are incomplete.
 - 3. RFI's that do not reference the contract documents.
 - 4. Improper RFI's will be processed by the Architect at the Architect's standard hourly rate. Such costs may be deducted by the Owner from monies due the Contractor. The Contractor will be notified by the Architect prior to the processing of improper RFI's.

1.3 CONTRACTOR'S REQUESTS FOR INTERPRETATION

- A. When the Contractor is unable to determine from the Contract Documents, the material, process or system to be installed, the Architect shall be requested to make a clarification of the indeterminate item.
 - 1. Wherever possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Architect.
- B. RFI's shall be submitted online using a web based program acceptable to the Architect.
- C. RFI's shall be originated by the Contractor.
 - 1. RFI's from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Architect.
 - 2. RFI's sent directly from Subcontractors to the Architect or the Architect's consultants shall not be answered.
- D. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFI's that request information available in the Contract Documents will be deemed either "improper" or "frivolous" as noted above.

- E. In cases where RFI's are issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items, the Contractor shall fully lay out a suggested solution using drawings or sketches drawn to scale, and submit same with the RFI. RFI's that fail to include a suggested solution will be returned unanswered with a requirement that the Contractor submit a complete request.
- F. RFI's shall not be used for the following purposes:
 - 1. To request approval of submittals
 - 2. To request approval of substitutions,
 - 3. To request changes which entail additional cost or credit.
 - 4. To request different methods of performing work than those drawn and specified.
 - 5. To confirm Owner direction or decisions.
- G. In the event the Contractor believes that a clarification by the Architect results in additional cost or time, Contractor shall not proceed with the work indicated by the RFI until a change order is prepared and approved.
 - 1. Answered RFI's shall not be construed as approval to perform extra work or incur additional expense.
 - 2. Unanswered RFI's will be returned with a stamp or notation: Not Reviewed.
- H. Architect will respond to RFI's in one of the following manners:
 - 1. Properly prepared RFI's:
 - a. Issue an "Architect's Supplemental Instruction" form.
 - b. Issue a "Request for Proposal" form.
 - c. Respond directly on the R.F.I. form.
 - 2. Improper or Frivolous RFI's:
 - a. Unanswered RFI's will be returned with a stamp or notation: "Not Reviewed".
- I. Contractor shall allow up to seven (7) days review and response time for RFI's, however, the Architect will endeavor to respond in a timely fashion to RFI's.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

Not applicable.

END OF SECTION

SECTION 01 2976

PROGRESS PAYMENT PROCEDURES

PART 1 GENERAL

1.1 GENERAL

This Section outlines (in general and as a convenience to the Contractor) submittals required for and to be used with the first pay request and the procedure to be used for all pay requests. This Section is complementary to the General Conditions and nothing within this Section shall be considered to waive any requirements of the General Conditions.

1.2 EXPANDED SCHEDULE OF VALUES

- A. In addition to the Schedule of Values required by the General Conditions, the Contractor shall submit, prior to the first pay request, an additional breakdown of the dollar amounts in the Schedule. Larger value amounts shall be broken down into major subcontracts and categories including, but not limited to:

Sitework:	Major earthwork, final grading, site utilities
Concrete:	Paving and sitework, sidewalks, building slabs and foundations, other structural concrete
Rough Carpentry:	Structural framing, interior framing and blocking, carpentry labor used to install items or assemblies supplied by others
Finish Carpentry:	Finish work and trim, cabinets and casework
Insulation:	Batt insulation, rigid board
Doors and Frames:	Hollow metal, wood, other
Glass and Glazing:	Windows, storefronts, translucent systems
Roofing:	Roof membrane, insulation, flashings
Drywall:	Light gauge studs, drywall systems
Ceiling:	Suspended or other ceiling systems
Painting:	Interior and exterior paint and stain
Flooring:	Carpet, sheet vinyl, VCT and base, other by specific type
Casework:	Cabinets and Casework
Plumbing:	Under-slab plumbing at buildings, rain drains, top out/rough-in, trim and fixtures
HVAC:	Equipment, ductwork, piping, temperature controls, energy management system, diffusers and trim, test and balance,
Electrical:	Site, underground, rough, fixtures, trim, switchgear, equipment, fire alarm, special A/V systems, intercom, phone
Others:	As the Architect may require to fairly and fully judge the value of the work in place

- B. Contractor shall submit copies of the Contractor's schedule at the time of each pay application meeting in accordance with the Contract as a condition for Certification of the Pay Request.

1.3 PAY REQUEST

- A. The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet, or equivalent submitted for Architect's approval prior to submitting for payment. A minimum

of three (3) original copies of these forms shall be submitted for each application. Submit additional copies if requested by the Owner or Architect.

- B. On or before the first day of each month the Contractor shall make an estimate of the work performed during the preceding month and submit same to the Architect for review. Within thirty (30) days after Owner approval of Pay Request, the Owner shall pay to the Contractor the Certified amount less any retention. The balance shall be retained by the Owner until final acceptance of the Work, as defined in the General Conditions and Supplementary General Conditions. Reduction in the amount retained or held in substitute securities will only be made as provided for in applicable statute or ordinance. Contractor request for reduction in retainage shall be accompanied by AIA Document G707A, "Consent of Surety to Reduction in or Partial Release of Retainage", if required.
- C. Prior to the first pay request, the Architect, Owner and Contractor will establish a schedule for pay requests. For each pay request a meeting shall be held at the project site where the Architect and Owner will meet with the Contractor prior to the submittal of the pay request and review the proposed values on the "draft" pay application request. Proposed values will be for work in place and stored materials (if allowed) projected not more than two (2) days past the date of the pay request. The values accepted at this review will then be entered on the Application for Payment. The Application for Payment shall be delivered, complete, to the Architect not less than three (3) days prior to the Application being due to the Owner.
- D. The Contractor shall submit a financial breakdown of the work, itemized by trades or sections. Payment will be based upon the monthly percentage of completion of these items and any stored materials (if allowed).
- E. Lien Waivers: General Contractor shall submit, along with the progress payment request, conditional lien waiver the sum of which shall be the amount of the progress payment issued to the General Contractor.
- F. The Contractor shall continually update Record Drawings per the requirements in Section 01 7700, Closeout Procedures. Review these updated drawings with the Architect at each pay request meeting or more often as directed. Up to date Record Drawings are required before a pay request will be approved.
- G. AIA Documents G706, Contractor's Affidavit of Payment of Debts and Claims, G706-A, Contractor's Affidavit of Release of Liens, Documents G707, Consent of Surety Company to Final Payment shall be used. These documents shall be submitted with the final application for payment. If appropriate, G707-A, Consent of Surety to Reduction in or Partial Release of Retainage shall be used.
- H. If at any time, the actual work progress falls 5% or more behind the scheduled progress, the Contractor shall submit a written plan to the Architect outlining his plan for placing the project back on schedule. Failure to provide this information shall be cause to withhold payment.

1.4 STORED MATERIALS

- A. When acceptable to the Owner, the Contractor may submit for payment on properly stored materials not yet incorporated into the work. Materials must be stored on the site in a secured area and be protected from damage, weather, theft or vandalism. The Contractor shall be responsible for replacing any damaged or missing materials.

- B. At the time of the Pay Request Meeting, stored materials for which payment is requested will be examined, counted and verified against actual bills of sale legibly listing all items, quantities and dollar values including freight. Mark-ups are not allowed. All invoices shall clearly indicate invoice numbers, purchase order numbers or tag numbers associated with the materials so that the materials can be quickly and clearly located in the storage areas. Copies of these invoices shall be provided to the Architect for his use and record and shall be attached to the submitted pay application and the totals shall equal or exceed amounts requested for the stored materials. Stored Materials shall be listed in the appropriate column of the Pay Application.

1.5 CHANGE ORDERS

- A. A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:
1. The change in the Work;
 2. The amount of the adjustment, if any, in the Contract Sum; and
 3. The extent of the adjustment, if any, in the Contract Time.
- B. Unless otherwise agreed to in the Contract, the maximum allowance for General Administration, Supervision, Insurance, Bonds, Overhead and Profit combined, taxes and other costs, included in the total cost to the Owner shall be based on the following schedule:

Subtotal Amount before
applying Percentage shown
(unless stated otherwise in the Contract)

Contractor, for work performed by his own force	18%
Subcontractor, for work performed by his own force	16%
Contractor, for work performed by Sub-Contractor	12%

1.6 ALLOWANCES/CONTINGENCIES

- A. At the time of the Pay Request Meeting, Allowance/Contingency Items for which payment is requested will be verified against invoices or previously approved Contractor proposals for work completed. Copies of these invoices or proposals shall be provided to the Architect at the Pay Request Meeting for his use and record, shall be attached to the submitted Pay Application, and the totals shall equal the amounts requested for Allowances/Contingencies. Allowances/Contingencies will be listed individually on the Pay Application per the Allowance Section.

END OF SECTION

SECTION 01 3113

PROJECT COORDINATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 1 Specification Sections, apply to this section.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 SUMMARY

- A. Requirements
 1. Review requirements and clearances of all building utilities and structural components above ceiling and coordinate the installation of all components to provide proper access and clearances to valves, access doors, ports, etc.
 2. Provide project interface and coordination as required to properly and accurately bring together the several parts, components, systems, and assemblies and as required to complete the Work and the Project.
 3. Provide interface and coordination of all trades, crafts, and subcontracts as required to provide correct and accurate connection of abutting, adjoining, overlapping, and related Work, and provide all anchors, fasteners, accessories, appurtenances, and incidental items as required to complete the Work properly, fully, and correctly in accordance with the Contract Documents.
 4. Provide additional structural components, miscellaneous metal, bracing, blocking, backing, clips, anchors, fasteners, and installation accessories as required to properly anchor, fasten, or attach materials, equipment, appliances, hardware, systems, assemblies, cabinets, and architectural features to the structure required to adequately support or back building components.
 5. Provide excavation and backfill, trenching and drilling for all trades as required for the installation of their Work.
 6. Provide concrete foundations, pads, supports, bases, and grouting for all trades as required for the installation of their Work.
 7. Provide caulking, sealing, and flashings as required to weatherproof the building complete and as required to insulate the building thermally and acoustically. Include caulking, sealing, flashings, and related work as required to prevent moisture intrusion, air infiltration, and light leakage.
 8. Provide equipment, appliances, fixtures, and systems requiring plumbing and mechanical services, rough-in, and connections, or other utilities and services, with such services, rough-in, and final connections.
 9. Terminations, connections, circuiting and conductors for appliances, fixtures, and indicated equipment required to complete the Work which are not provided by Subcontractors shall be provided by the Contractor.

10. Materials, equipment, component parts, accessories, incidental items, connections, and services required to complete the Work that are not provided by Subcontractors shall be provided by the Contractor.
- B. Field Measurements and Templates:
1. Obtain all field measurements required for the accurate fabrication and installation of the Work. Exact measurements are the Contractor's responsibility.
 2. Furnish or obtain templates, patterns, and setting instructions as required for the installation of all Work. Verify all dimensions in the field.
- C. Responsibility
1. The Contractor shall be in charge of this Contract and the site, as well as the directing and scheduling and coordination of all Work.
 2. Final responsibility for the performance, interface, and completion of the Work and the Project in accordance with the Contract Documents shall be with the Contractor.

END OF SECTION

SECTION 01 3119

PROJECT MEETINGS

PART 1 GENERAL

1.1 PROJECT MEETINGS

- A. General: Contractor will schedule and conduct meetings and conferences at the Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within two (2) days of the meeting.
 - 4. Preconstruction Conference: Contractor will schedule and conduct a preconstruction conference before starting construction, at a time convenient to the Owner and Architect.
 - 5. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference when appropriate. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 6. Agenda: Discuss items of significance that could affect progress, including the following:
 - a) Tentative construction schedule.
 - b) Phasing.
 - c) Critical work sequencing and long-lead items.
 - d) Designation of key personnel and their duties.
 - e) Lines of communications.
 - f) Procedures for processing field decisions and Change Orders.
 - g) Procedures for RFIs.
 - h) Procedures for testing and inspecting.
 - i) Procedures for processing Applications for Payment.
 - j) Distribution of the Contract Documents.
 - k) Submittal procedures.
 - l) Preparation of record documents.
 - m) Use of the premises
 - n) Work restrictions.
 - o) Working hours.
 - p) Owner's occupancy requirements.
 - q) Responsibility for temporary facilities and controls.
 - r) Procedures for moisture and mold control.
 - s) Procedures for disruptions and shutdowns.
 - t) Construction waste management and recycling.
 - u) Parking availability.
 - v) Office, work, and storage areas.
 - w) Equipment deliveries and priorities.
 - x) Progress cleaning.

7. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- B. Pre-installation Conferences: Conduct a pre-installation conference for systems as specified herein.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents
 - b. Options
 - c. Related RFIs
 - d. Submittals
 - e. Review of mockups
 - f. Compatibility requirements
 - g. Weather limitations
 - h. Manufacturer's written instructions
 - i. Warranty requirements
 - j. Compatibility of materials
 - k. Acceptability of substrates
 - l. Space and access limitations
 - m. Regulations of authorities having jurisdiction
 - n. Testing and inspecting requirements
 - o. Installation procedures
 - p. Coordination with other work
 - q. Required performance results
 - r. Protection of adjacent work
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to the performance of the Work and reconvene the conference at the earliest feasible date.
- C. Progress Meetings: Contractor will conduct progress meetings. Frequency of progress meetings to be determined.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to the representatives of the Owner and Architect, each subcontractor, and other entity concerned with current progress or performance of future activities shall be represented. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction, behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

END OF SECTION

SECTION 01 3216

CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.1 SUMMARY

- A. Related Documents
 - 1. Drawings and General Provisions of the Contract, including Supplemental and General Conditions and other Division 01 Requirements apply to work of this section.

1.2 CPM SCHEDULE REQUIRED

- A. All schedule and report work under this Contract shall be performed using a computer-based critical path method, hereinafter referred to as CPM. Requirements for CPM are included to ensure adequate planning and execution of the work and to assist the Architect in evaluating progress of the work, both economically and chronologically.

1.3 TIME OF COMPLETION

- A. Contractor's time of completion shall adhere to the time specified in the Contract unless an earlier (advanced) time of completion is agreed to by the Owner. Any such agreement shall be formalized by a Change Order. All days or time referenced in this section are calendar days unless otherwise noted.

1.4 CONTRACT SCHEDULE

- A. Within twenty-eight (28) days after execution of the Contract the Contractor shall present the construction approach and explain the schedule logic, duration and sequencing. The schedule shall cover the entire contract time and incorporate, in detail, the first ninety (90) calendar days of the preliminary schedule.
 - 1. The above generated schedule shall include:
 - a. Working activities and General Conditions activities shall be identified separately.
 - b. Milestone activities identifying completion of each stage of work.
 - c. Owner furnished materials or equipment identified as separate activities for delivery and installation.
 - d. Activities for review of shop drawings/samples shall not be less than fifteen (15) calendar days for specified product submittals or products required by performance specifications. For submittals involving material or equipment substitutions, the activity shall be not less than thirty (30) calendar days.
 - e. Activities for procurement of major equipment or long lead items.
 - f. An activity with not less than twenty (20) calendar days shall be designated for generating and correcting punch list items for each identifiable phase.
 - g. Activities shall be included for start-up and testing of equipment.
 - h. Activities shall be included for Owner training.
 - i. A responsibility code assigned to each activity corresponding to the subcontractor responsible for performing the work.
 - j. A CSI code for each activity.
 - k. The assigned dollar value (cost loading) and quantities of each activity of the schedule shall cumulatively equal the contract amount.

2. Upon acceptance of the CPM schedule, it will be incorporated into the Contract as the Contract Schedule. All monthly payment requests will be generated from the updated Contract Schedule. Acceptance of the Contract Schedule will be a condition precedent to the making of any progress payments under the Contract.

1.5 CONTRACTOR'S RESPONSIBILITY

Contractors Responsibility for Completion:

- A. The Contractor shall furnish sufficient forces, offices, facilities and equipment, and shall work such hours including night shift and overtime operations, as necessary to ensure the prosecution of the Work in accordance with the current monthly Contract Schedule. If the Contractor falls behind in meeting the Contract Schedule as noted by negative float, the Contractor shall take such steps as may be necessary to improve the progress of work without additional cost to the Owner.
- B. Failure of the Contractor to comply with the requirements of the above paragraph shall be a basis for determination by the Owner's Representative that the Contractor is not prosecuting the work with such diligence as will ensure completion within the contract time. Upon such determination, the Owner's Representative may terminate the Contractor's right to proceed with the work or any separable part thereof, in accordance with the provisions of the Contract, or may take such other actions as may be deemed appropriate.

1.6 FLOAT TIME

- A. Float Time is the amount of time between the earliest start date and latest start date, or between the earliest finish date and the latest finish date of an activity in the Contract Schedule. This time is not for exclusive use by either the Owner/Architect or the Contractor. No time extensions or associated delay or impact costs will be allowed for delays caused by the Owner/Architect, on paths of activities containing float time, providing such delay does not exceed the float time, per the latest updated version of the Contract Schedule in effect at the time of the delay or impact.

1.7 CONTRACTOR'S SCHEDULING REPRESENTATIVE

- A. The Contractor shall designate a scheduler who is trained and experienced in compiling construction scheduling data and in analyzing scheduling data by the use of computer-based CPM, and in preparation and issuance of periodic reports as required herein. The Contractor's Scheduling Representative shall have direct control and complete authority to act on behalf of the Contractor in fulfilling all project schedule requirements.

1.8 ACCEPTANCE OF CONTRACT SCHEDULE

- A. Upon acceptance of the Contract Schedule by the Architect, the Contract Schedule will be used as a basis for determining progress payments. Monthly progress payments shall be based upon information developed at the monthly Schedule Update. Acceptance by the Architect of the Contractor's Contract Schedule does not relieve the Contractor of any responsibility whatsoever for the accuracy of feasibility of the Contract Schedule, or of the Contractor's ability to meet the contract completion date. Nor does such acceptance create a warranty, expressed or implied, or acknowledge or admit the reasonableness of the activities, logic, duration manpower, cost or equipment loading of the Contractor's schedule.

- B. In the event the Contractor fails to define any element of work, activity or logic and the Architect review does not detect this omission or error, such omission or error, when discovered by the Contractor or Architect, shall be corrected by the Contractor at the next schedule update and shall not affect the Contract time.

1.9 MONTHLY SCHEDULE UPDATE

- A. The Contract Schedule shall be updated on a monthly basis throughout the entire Contract time and until Substantial Completion. The Contractor shall meet with the Architect each month to review actual progress preceding the progress payment submittal deadline. Estimates of the percent completion of each Schedule activity and the necessary supporting data shall be submitted for review and shall include the following information:
 - 1. One (1) original and three (3) reproduced marked-up copies of the previous month's Schedule Update computer produced reports coordinated with the requirements of the above paragraphs and indicating actual activity start and/or complete dates, revised (current) remaining duration, and percent complete with regard to activity cost/progress.
 - 2. The Contractor shall indicate in writing those activities he plans to work on during the following month and current or anticipated conditions that may delay the work.
 - 3. Any additional written information necessary to support the above.
- B. In the case of disagreements, concerning actual progress to date, the Architect's determination shall govern.
- C. The Contractor shall revise the Contract Schedule to reflect actual progress and any revisions to the Contract Schedule. The Contractor shall forward the revised Contract Schedule and Pay Application to the Architect.
- D. Each Contract Schedule update will be forwarded to the Architect and will include three (3) copies of the following information:
 - 1. A list of all activities completed during the preceding month.
 - 2. A list of all activities started but not completed during the preceding month, including percent complete.
 - 3. A list of any revisions to the Schedule logic, initial activity duration, or activity costs.
 - 4. Time-scaled network diagram showing all activities and their relationships.
 - 5. A narrative report with the updated progress analysis, which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, and explanation of corrective action taken, and any proposed revisions for recovery.
- E. The monthly updating of the Contract Schedule shall be an integral part and basic element of the estimate upon which progress payments will be made. If, in the judgment of the Architect, the Contractor fails or refuses to provide information required to accomplish a complete Contract Schedule Update or revision as specified hereafter, the Contract shall be deemed to have not provided the required estimate upon which progress payments may be made, and shall not be entitled to progress payments until it has furnished the information necessary for a complete Schedule Update in accordance with the provisions of this Section.

1.10 SHORT INTERVALS SCHEDULES

- A. Two Week Projection:
 - 1. The interval shall be a two week projection and include the week submitted and the week thereafter.
 - 2. It shall contain sufficient detail to evaluate daily milestones and shall identify and tie into existing activities in the approved Contract Schedule.

1.11 CONTRACT SCHEDULE REVISIONS

- A. Revised Schedules:
 - 1. If there are significant changes, as determined by the Owner, in the plan of construction from that shown in the Accepted Contract Schedule, Contractor shall submit within fifteen (15) days a revised schedule to the Owner for approval.
- B. Proposed Change Orders:
 - 1. When a Change Order is proposed or a proposal Request is issued that has the potential to impact specified completion dates, a schedule update shall be prepared by the Contractor to reflect the impact of such changes. After the schedule update has been mutually agreed upon, and a Change Order executed, the additional time shall be incorporated into the Contract Schedule. Time extensions will be considered only to the extent that there is insufficient remaining float to accommodate these changes without affecting the critical path.
- C. Additional Costs:
 - 1. No additional cost beyond that provided in the Contract will be allowed for the incorporation of approved Proposed Change Orders into the Contract Schedule.

1.12 PARTIAL PAYMENT

- A. Partial payment where allowed by contract will be based on the update of the Contract Schedule.
- B. Partial payments for the mobilization costs shall not exceed the following (exclusive of bonds and insurance):
 - 1. When 5 percent of the original contract amount is earned, 50 percent of the amount bid for mobilization, or 5 percent of the original contract amount, whichever is lesser, may be paid.
 - 2. When 10 percent of the original contract amount is earned, 75 percent of the amount bid for mobilization or 7.5 percent of the original contract amount, whichever is lesser, may be paid.
 - 3. When 20 percent of the original contract amount is earned, 95 percent of the amount bid for mobilization, or 9.5 percent of the original contract amount, whichever is lesser, may be paid.
 - 4. When 50 percent of the original contract amount is earned, 100 percent of the amount bid for mobilization, or 10 percent of the original contract amount, whichever is lesser, may be paid.
 - 5. Upon completion of all work on the project, payment of any amount bid for mobilization in excess of 10 percent of the original contract amount will be paid.

- C. "Mobilization" includes preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidental to the project site, for the establishment of all offices, buildings and other facilities necessary for work on the project, and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site.

END OF SECTION

SECTION 01 3300
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTALS REQUIRED OF THE CONTRACTOR

The listing of required submittals that follows is compiled for convenience. Absence from the list of a submittal required elsewhere in these specifications does not relieve the Contractor of his responsibility to make all required submittals.

<u>Time Due:</u> At time of contract execution	<u>Submittal:</u> Performance Bond Labor and Materials Payment Bond Document supporting Power of Attorney Certificates of Insurance
Within 28 days of execution of contract	Construction Schedule Schedule of Values Subcontractor Bonds (if required) Schedule of Submittals
Each month	Updated Construction Schedule Partial Payment Application Lien Waivers
At time of request for Substantial Completion	Contractor's written "Punch List" Owner/Operator Training Schedule Certificate of Occupancy from AHJ H.V.A.C. Test and Balance Report(s) AZDHS Construction Closeout Documents (if applicable)
At Final Completion	Completed Record Drawings Completed Maintenance Manuals and Operating Instructions Warranties for all building components AIA G706, Contractor's Affidavit of Payment of Debts and Claims AIA G706-A, Contractor's Affidavit of Release of Liens AIA G707, Consent of Surety Company to Final Payment Application for Final Payment

1.2 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Shop Drawings: The term "Shop Drawings" includes but is not limited to fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogs, brochures, performance and test data pertaining to materials and equipment systems and methods of construction as may be required to show that the materials, equipment or systems and the positions and layout of each conform to the Contract requirements. As used herein the term "manufactured" applies to standard units usually mass-produced and 'fabricated' means items specifically assembled or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items; indicate proper relation to adjoining Work; amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.
- B. Submittal Schedule: Submission of Shop Drawings and samples to the Architect is required for only those items specifically mentioned in the Specification Sections. Within twenty-eight (28) days of execution of construction contract, Contractor shall provide a submittal schedule indicating all items that are to be provided for A/E review and the date each is to be received by the Architect and the date required for return of same. Unless other arrangements are made in advance, Contractor's schedule shall allow for a review period of ten (10) working days. If Contractor submits Shop Drawings for items other than those items specifically requested, the Architect will not be obliged to review them. Contractor shall be responsible for the procuring of Shop Drawings for his own use as he may require for the progress of the work, even though the Shop Drawings may not require the Architect's review.

- C. Contractor is responsible for scheduling and organizing the submittals from the various subcontractors and suppliers and verifying compliance with the contract documents. All submittals are to be indexed and clearly labeled with the C.S.I. (2004 MasterFormat) section number and title. Following Contractor's review and approval, Contractor shall submit electronic versions (.pdf or similar) using a web-based program acceptable to the Architect. If any submittals are not able to be scanned and submitted electronically, Contractor shall provide the required number of hardcopies to the Architect for review. The Architect will review and affix a stamp indicating the findings of the review and will return same to the Contractor. Comments, if any, will be noted directly on the submittal or attached. The Contractor shall then distribute copies to the various trades and to Contractor's job personnel as required.
- D. Samples: Submit to the Architect for review and/or selection all samples and appropriate information for the Architect to select all colors, textures, fabric and finishes for the entire project. Final selection of color, textures, fabrics or finishes will not be made until all applicable and related submittals have been provided to the Architect. Samples required other than for selection of color, texture, fabric or finish shall be delivered to the Architect at a time determined by the Contractor, that allows for any necessary resubmittal and that will not cause any delay in the Work.
- E. Fire Alarm System/Fire Sprinklers System Shop Drawings shall be submitted to the authorities having jurisdiction (AHJ) by the Contractor and approval obtained prior to installation. Inspection, testing and approval of completed installations shall be obtained prior to acceptance of the systems and shall be a condition of Substantial Completion of the Project.

1.3 QUALITY CONTROL SUBMITTALS

- A. Manufacturer's Instructions: Where any item or work is required by Specifications to be furnished installed or performed in accordance with a specified product manufacturer's instructions, Contractor shall procure and distribute the necessary copies of such instructions to concerned parties.
- B. Certificates: When requested by the Architect, the Contractor shall deliver to the Architect, prior to final acceptance of the Work as a whole, signed certificates from suppliers of materials and manufactured items stating that such items conform to the Contract Documents.
- C. Field Test Reports: Portions of the work may require special testing, inspections, certification, etc. as indicated in this Project Manual. Properly prepared written summaries, reports, etc., as required shall be forwarded to the Architect through the Contractor promptly upon completion. Compliance with this requirement will be a condition for payment.

END OF SECTION

SECTION 01 3301

SUBSTITUTION OF MATERIALS OR PRODUCTS DURING CONSTRUCTION

PART 1 GENERAL

- 1.1 To be considered, substitutions must be made in accordance with these instructions.
- 1.2 When a specific product is specified for use in the project, it is to establish a standard of quality and shall not be construed as limiting competition. It is the Architect's and Engineers' intent that "Substitutions during Construction" match the specified product, system, equipment or material criteria including, but not limited to, color, texture, size, weight, utility requirements, working clearances, capacity, volume, speeds, power, BTU's, etc.
- 1.3 This project is to include only the products, materials, equipment and systems that are indicated on the Drawings, and are specified or approved through the "Substitution Prior to Bid" process. In order for "Substitutions During Construction" to be considered by the Owner, Architect and Engineers, the Contractor shall demonstrate that the specified or Prior Approved product, material, equipment or system is not available after award of the Contract. Requests for "Substitution During Construction" shall contain sufficient information, descriptive brochures, drawings, samples or other data as is necessary to provide direct comparison to the specified materials.
- 1.4 Products proposed as "Substitutions" must be fully compared to the product, material, equipment or system specified. Contractor shall thoroughly review and compare the Specifications for both the specified item and proposed "Substitution During Construction", and clearly identify in writing to the Architect and Engineer, any differences between the items. Differences that are to be identified shall include, but not be limited to, size, weight, utility requirements, working clearances volume, capacity, speeds, power, BTU's, etc. Should the Architect and Engineer deem any differences to be unacceptable, the "Request for Substitution During Construction" shall be rejected.
- 1.5 All requests for "Substitution During Construction" will be accompanied by a "Substitution of Materials During Construction" Request Form, that is a part of this Specification section. Requests not accompanied by the Form will not be reviewed. Requests for "Substitution During Construction" shall be in the hands of the Architect no later than twenty-eight (28) calendar days prior to date Contractor is required to place an order for the product of material.
- 1.6 Each submittal shall be well marked and identified as to types and kind of the items being submitted for approval. It is the sole responsibility of the Contractor to submit complete descriptive and technical information to the Architect so the Architect can make proper appraisal. Lack of proper information will be sufficient cause for rejection. Reference to catalogs will not be acceptable unless catalog is submitted with Substitution Request Form. All pertinent information shall be clearly marked by the Contractor and shall be specific to the product in question.
- 1.7 It is the Contractor's responsibility to confirm and correlate quantities and dimensions and coordinate with trades whose work may be affected by the requested substitution.
- 1.8 In submitting a Request for Substitution During Construction, the Manufacturer and Contractor shall make the following representations:
 - A. The specified or prior approved product, material, equipment or system is not available, does not comply with current or local codes or is not approved by the AHJ.

- B. The proposed product is equal or superior in all respects to that specified.
- C. The Substitution carries the same or better Warranty as the specified product, materials, equipment or system.
- D. Installation of the accepted Substitution shall be incorporated into the Work, making such changes as may be required for the Work to be completed in every respect and at no additional cost to the Owner.
- E. Claims for additional costs related to the Substitution that subsequently become apparent, shall be waived by the Contractor.
- F. Cost data is complete and includes related costs under the Contract but excludes costs under separate construction contracts and design consultant's redesign.

1.9 If, at any time, any differences in the performance or physical characteristics of the proposed "Substitutions During Construction" and are determined to be a liability to the performance, operation or design intent of the building, the Contractor shall be required to replace said product, material, equipment or system with the originally specified product at Contractor's expense, as well as compensate the Owner for any costs associated with the substituted product, material, equipment or system.

SUBSTITUTION OF MATERIALS DURING CONSTRUCTION REQUEST FORM

TO:_____

PROJECT:_____BID DATE:_____

We submit for your consideration the following product instead of the specified item for the above project:

Section	Page/Sheet No.	Paragraph/Line	Specified Item
_____	_____	_____	_____

Proposed Substitution:_____

Reason for substitution:_____

Attach complete product description, drawings, photographs, performance and test data, available colors/finishes, and other information necessary for evaluation. Identify specific model numbers, finishes, options, etc.

A. Will changes be required to building design or any components or assemblies in order to properly install and operate proposed substitution? Yes _____ No _____.
If yes, explain:

B. List description of the difference proposed for each substitution and specified item.

<u>Specified Item</u>	<u>Proposed Substitution</u>
_____	_____
_____	_____
_____	_____
_____	_____

C. Does substitution affect Drawing clearances and/or dimensions? Yes _____ No _____.
If yes, explain: _____

D. What effect does substitution have on other trades? List affected trades._____

- E. Does manufacturer's warranty of proposed substitution differ from that specified?
Yes _____ No _____ If yes, explain: _____

- F. Will substitution affect progress schedule? Yes _____ No _____ If yes, explain:

- G. Will substitution require more license fees or royalties than specified product?
Yes _____ No _____ If yes, explain: _____

- H. Will maintenance and service parts be locally available for substitution?
Yes _____ No _____ If no, explain: _____

- I. Will substitution require additional testing, inspection, certification or approvals?
Yes _____ No _____ If yes, explain: _____

In submitting this "REQUEST FOR SUBSTITUTION OF MATERIALS DURING CONSTRUCTION" Contractor represents the following:

1. The proposed product is equal or superior in all respects to that specified
2. The Substitution carries the same or better Warranty as the specified product, materials, equipment or system.
3. Installation of the accepted Substitution shall be incorporated into the Work, making such changes as may be required for the Work to be completed in every respect, at no additional cost to the Owner.
4. Claims for additional costs related to the Substitution,, that subsequently become apparent, will be waived by the Contractor.
5. Cost data is complete and includes related costs under the Contract but excludes costs under separate contracts and design consultant's redesign.
6. If, at any time, any differences in the performance or physical characteristics of the proposed "Substitutions During Construction" and are determined to be a liability to the performance, operation or design intent of the building, the Contractor shall be required to replace said product, material, equipment or system with the originally specified product at Contractor's expense, as well as compensate the Owner for any costs associated with the substituted product, material, equipment or system.
7. The Contractor understands that he will pay for changes to the building design, including engineering and drawing costs, caused by requested substitution.

Submitted by General Contractor:

Signature

Date

For Architect's Use:

____ Accepted ____ Accepted as Noted ____ Not Accepted

By _____

Date _____

Remarks _____

For Engineer's Use:

____ Accepted ____ Accepted as Noted ____ Not Accepted

By _____

Date _____

Remarks _____

For Owner's Use:

____ Accepted ____ Accepted as Noted ____ Not Accepted

By _____

Date _____

Remarks _____

END OF SECTION

SECTION 01 4500

QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section describes regulatory requirements, quality control, and quality assurance procedures.
- B. This Section is complimentary to the General Conditions, Supplementary Conditions, General Structural Notes, and local code requirements and nothing contained herein shall be considered to waive any such requirement.

1.2 REGULATORY REQUIREMENTS

- A. Design Criteria: Every reasonable effort has been made to design this Project in accordance with the applicable regulatory requirements. Regulatory requirements are interpretive by nature and the Architect cannot warrant compliance; only officials of the enforcing agencies can attest to compliance.
- B. Construction methods: the responsibility for constructing this Project in compliance with the latest edition of all applicable building codes and regulatory requirements rests solely with the Contractor and his subcontractors. All work shall comply with codes and regulations noted herein.
- C. Conflicts: If a conflict is found between regulatory requirements and information contained in the Contract Documents, the Contractor shall immediately report the conflict to the Architect. Contractor shall not proceed with any Work that he knows to be in violation of either the regulatory requirements or the Contract Documents. The fact that a regulatory official may accept a particular product and/or system does not relieve the Contractor from providing what is required by the Contract Documents.

1.3 QUALITY CONTROL

- A. The Contractor shall schedule the times for Special Inspections and Materials Testing with the consultant providing the service, so as to coordinate with the construction progress. Appointments for such services shall be made twenty-four (24) hours in advance or greater. Refer to the General Structural Notes in the Drawings for Special Structural Inspection requirements.
- B. Where specific instructions in these specifications require that a particular product and/or material be installed and/or applied by an "approved applicator" of the manufacturer, it is the Contractor's responsibility to ensure that the subcontractor employed for such work be an approved applicator. Such subcontractor(s) shall provide evidence of being an approved applicator when requested by the Architect.
- C. Where not more specifically described in the Specifications, workmanship shall conform to the methods and operations of best standards and accepted practices of the trade or trades involved, and shall include all items of fabrication, construction or installation regularly furnished or required for completion (including any finish), and for successful operation as intended.

- D. Work shall be executed by mechanics skilled in their respective lines of work.
- E. If a product or material is indicated or shown for an application other than that intended by the manufacturer, the supplier, installer or manufacturer shall notify Architect prior to bidding.
- F. UL Label: Where applicable, materials and equipment for which Underwriter's Laboratories, Inc. standards have been established, and their label services available, shall bear the appropriate UL label.
- G. Anything in the Contract Drawings notwithstanding, the Contractor accepts the responsibility of construction of a watertight, weathertight project.

1.4 TESTING AND INSPECTION SERVICES

- A. Selection of inspection and/or testing company:
 - 1. Special Structural Inspections: By Structural Engineer of Record's assigned personnel.
 - 2. Special electrical Inspections: By Electrical Engineer of Record's assigned personnel.
 - 3. Earthwork and Material Tests: By the same company that prepared the Geotechnical Engineering Report. Where no Geotechnical Engineering Report was prepared the Testing Company shall be selected by the Contractor and approved by the Architect.
- B. The Owner will retain and pay the expenses of the services for special structural and special electrical inspections.
- D. The Contractor shall retain and coordinate an Earthwork and Materials Testing Laboratory to perform the work called for in the Contract Documents. Testing Laboratory to invoice Owner directly.
- F. Contractor shall pay all costs associated with dry runs and for all re-testing costs (e.g. removals and replacements of subject material, additional field testing, laboratory service, Architect's review time).

1.5 SUBMITTALS

- A. Special Inspection Reports: Inspecting Agent will submit a copy of report to the Contractor and a copy to the Architect. Contractor to make additional copies as required and distribute to all affected subcontractors and material suppliers.
- B. Distribution of test reports: The Testing Agency shall distribute copies of all reports to the offices of the parties concerned as follows:
 - 1 copy to the Architect
 - 1 copy to the Structural Engineer
 - 1 copy to the Owner
 - 1 copy to the Contractor
 - 1 copy to the Supplier being tested

Requirements for additional copies will be determined upon commencement of the Contract.

PART 2 PRODUCTS

- 2.1 General: As determined by the Inspection/Testing Company

PART 3 EXECUTION

- 3.1 Testing Methods: As determined by the Inspection/Testing Company and/or as required to satisfy the A.H.J.
- 3.2 Required Special Inspection and Material Testing:
- A. Preparation of existing soil and pad construction: Verify compliance of site preparation by Special Inspection to ensure compliance with referenced Geotechnical Engineering Report and other sections applicable.
 - B. Excavations: After foundations have been excavated and prior to placing any reinforcing steel or concrete, inspect excavations to verify compliance by Special Inspection to ensure:
 - 1. Foundation excavations are free of loose soils and compacted to specified densities.
 - 2. Dimensions are as indicated on the Drawings.
 - C. Structures: At observable stages and as indicated in the General Structural notes in the Drawings, provide Special Inspections for site and building construction to ensure conformance with contract documents.
 - D. Electrical: Provide for Special Inspection of the electrical service entrance as indicated in the electrical drawings to ensure conformance with the contract documents.
 - E. Concrete: Mold four (4) cylinders for each test; one for 7 day, two for 28 day and one for hold.
 - 1. Structural Concrete: Test per IBC 1905.6; one test of each type strength/class of concrete for every 150 cubic yards but no less than one test each day's pour nor less than once for each 5000 square feet of surface for slabs or walls. Structural concrete includes foundations, building slabs-on-grade and tilt-up pre-cast concrete panels.
 - 2. Walks, Curbs and Driveway Paving: One test for each 20 cubic yards.
 - F. Mortar: Shall conform to the proportion specifications of IBC Table 2103.8(1) or the property specifications of IBC Table 2103.8(2).
 - G. Grout: Test per IBC 2105.2.2; minimum 1 test of every day's delivery of grout. Take 3 test specimens for each test.
 - H. Spray- On- Fireproofing: Test per IBC 1704.10 and its subsections.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 GENERAL

- A. The Contractor shall be responsible for and comply with codes and regulations regarding potable drinking water, sanitation, dust control, fire protection, and other temporary controls.
- B. Temporary office facilities, toilets, storage sheds and other construction of temporary nature shall be removed from the site as soon as, the progress of the work will permit and as agreed to by Owner, and the portions of the site occupied by same shall be properly reconditioned and restored to a condition acceptable to the Owner.
- C. Contractor shall obtain written approval from the Owner a minimum of 72 hours prior to disconnection or shutting off service or utility.

1.2 TEMPORARY UTILITIES

- A. Temporary Electricity:
 - 1. Temporary electric service required in the performance of the Contract shall be furnished and paid for by the Contractor who shall furnish, install and maintain temporary poles and overhead construction, transformers, meters, drops and other wiring and fittings for both light and power at locations required in the Work, and shall bear the cost of making the service connections. Temporary generators shall be supplied until temporary or permanent power can be provided. Before final acceptance, temporary electrical service facilities installed by the Contractor shall be removed, excavations backfilled and compacted and the service connections severed in acceptable manner.
- B. Temporary Lighting:
 - 1. Adequate lighting and convenience outlets shall be furnished and installed as may be necessary for proper performance and inspection of the Work. If operations are carried on during hours of darkness, adequate illumination shall be furnished and maintained during hours that natural illumination is insufficient for the Work being performed. Artificial lighting shall be placed in all areas where Work under the Contract is in progress. Lighting level shall be an average of 20 f.c. minimum.
- C. Temporary Heating and Cooling:
 - 1. When required for proper installation or protection of any portion of the Work, the Contractor shall maintain an interior building temperature between 60° - 85° F.
 - 2. When the permanent heating, ventilation and air conditioning systems are installed and operable, the Contractor shall be responsible for operation and paying costs in connection with such operations. Prior to Substantial Completion, registers, diffusers and filters shall be cleaned or replaced as appropriate
- D. Temporary Water:
 - 1. Water required for the performance of the Contract shall be provided and paid for by the Contractor from onsite source.
 - 2. The Contractor shall furnish and install temporary mains, laterals, branch lines, and service piping and fittings to supply water in sufficient quantity at required

locations of the building and shall bear costs of making the service connections. Temporary piping shall be removed completely, and openings closed in an acceptable manner prior to Final Completion of the Work.

- E. Temporary Sanitary Facilities: The Contractor shall provide temporary chemical toilet structures with urinals in numbers as required, located as approved and maintained in a clean and sanitary condition.
- F. Temporary Fire Protection: The Contractor shall provide and maintain fire extinguishers, fire hoses and other equipment as necessary for proper fire protection during construction. Such equipment is to be used for fire protection only.
- G. HVAC Equipment: Unless owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of (8) at each return air grille in system and remove at end of construction.

1.3 BARRIERS AND ENCLOSURES

- A. Temporary Barricades: Within existing structures shall be dustproof and adequately braced. Between barricade and existing finish, provide a compressible seal to prevent the passage of dust. Temporary doors shall be installed with appropriate hardware to provide exits at end of corridors. Such doors shall not be used by workmen except with permission by the Owner. The barricade shall be painted on the public side and emergency exits labeled.
- B. Temporary closures: The Contractor shall erect temporary closures over openings when weather conditions render such action necessary for proper installation of portion of the Work.
- C. Temporary Fence:
 - 1. Provide a fence to secure the construction and staging areas from surrounding activity.
 - 2. Work, storage, staging, etc., areas shall be fenced. Carefully control and supervise traffic to and from the area of Work.
- D. Barricades: Should Government, State or local authorities require construction of temporary barricades or covered passageways, they shall be constructed by the Contractor at no additional cost to the Owner, and be painted and maintained in an orderly, neat appearance at all times.

1.4 ACCESS ROADS AND PARKING

- A. Temporary emergency vehicle access route(s) shall be constructed where required and in accordance with the local jurisdiction. This temporary access route may be located along the same route as the designed vehicle access and may be incorporated into the final construction where acceptable to local authorities.
- B. Contractor shall use, and maintain in clean condition site access route as shown on site or site access plan.
- C. Contractor and other persons connected to this Project will only use parking areas designated on site plan or as approved by the Owner.

- D. Contractor and workmen shall not trespass into area beyond the "Limit of Work" area.

1.5 TEMPORARY CONTROLS

A. Construction Cleaning:

1. Clean up daily refuse, rubbish, scrap materials and debris caused by operations, such that at all times the site of the work shall present a neat, orderly and workmanlike appearance.
2. Remove surplus material, false-work, temporary structures, including their foundations, plant of any description and debris of every nature resulting from operations and put the site in a neat, orderly condition.
3. Use only cleaning materials recommended by manufacturer of surface to be cleaned. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
4. Provide for the disposal of waste products, trash, debris, etc., and make necessary arrangements for legal disposal of same off the site. Never throw rubbish from windows or other parts of building. Lower waste materials in a controlled manner with as few handlings as possible.
5. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for acceptance.
6. Schedule cleaning operations such that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

B. Noise Control:

1. The noise generated by construction of this Work may at times create a problem for the Owner.
2. The Owner recognizes and can tolerate the normal level of noise created by a majority of construction activity and, therefore, does not feel a need to set certain hours of the day when noise will be restricted.
3. However, the Owner recognizes that, during certain construction work such as connecting to the existing building, the noise level may be unusually higher than normal. These higher levels of noise generation may conflict with a specific activity being simultaneously conducted by the Owner.
4. The Contractor shall secure agreement from the Owner prior to scheduling unusually noisy activity, and Contractor shall cooperate if an on-going activity becomes objectionable by its longevity or overlapping into a program started later by the Owner. It is understood and agreed that both parties will cooperate to the end that neither will be unduly inconvenienced by this requirement.

C. Surface Water Control:

1. Pumping and Drainage: Surface or subsurface water or other fluids shall not be permitted to accumulate in excavations nor in or about the premises and vicinity thereof. Should such conditions be encountered or develop the water or other fluid shall be controlled and suitably disposed of by means of temporary pumps, piping drainage lines, troughs, ditches, dams, or other methods as approved by the Architect.

1.6 PROJECT IDENTIFICATION

- A. No freestanding signs will be permitted on this project except the Project Identification sign, identifying captions over offices, certain directional signs and warning signs required for safety and protection. The Contractor shall take necessary steps to prevent installation of unauthorized signs.

- B. Project Banner: The project identification banner shall be 8 oz. mesh banners with brass grommets at 24 inches o.c. Exact size and graphic design to be provided by architect. Size: (Height = approximately 72", Width = approximately 12')

1.7 FIELD OFFICE

- A. The Contractor shall provide a weather-tight and water-tight office facility for the Architect's project representative with the following minimum requirements:
 - 1. Suitable workspace area and seating within project's temporary field office.
 - 2. A wired or wireless access point (WAP) within the field office with a minimum data port spread of 10.0 mbps.

END OF SECTION

SECTION 01 5723

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Storm Water Pollution Prevention and Pollution Control Plan as required by the Texas Commission on Environmental Quality (TCEQ), effective March 2018.
- B. Related Sections:
Section 31 00 00 - Earthwork

1.02 QUALITY ASSURANCE

- A. State Standards: Execution of the Pollution Prevention and the Pollution Control Plan shall meet all requirements set forth by TCEQ under the Texas Pollution Discharge Elimination System (TPDES) regulations.

PART 2 - PRODUCTS

NOT APPLICABLE.

PART 3 - EXECUTION

3.01 PERFORMANCE

- A. General: Implement all the requirements detailed in the Erosion Control Plan and any additional pollution prevention and control measures required by the TCEQ.
- B. The Erosion Control Plan is included as part of the construction plans. The erosion control measures shown on the plans are the minimum required for this project. The contractor shall implement additional erosion control devices as construction sequence and activities dictate.
- C. The SWPPP document (including N.O.I. and N.O.T.) that makes up the balance of the SWPPP shall be prepared by the contractor at his expense. The contractor shall be the Owner/Operator of the SWPPP and responsible for executing and filing the N.O.I. and N.O.T. and paying all fees required by TCEQ.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 DELIVERY AND STORAGE OF MATERIALS

- A. Deliver manufactured materials in the original packages, containers or bundles (with the seals unbroken) bearing the name or identification mark of the manufacturer.
- B. Deliver fabrications in as large assemblies as practicable and where specified to be shop-primed or shop-finished, they shall be packaged or crated as required to preserve such priming or finish intact and free from abrasion.
- C. Store materials in such manner as necessary to properly protect same from damage, as materials or equipment damage by handling, weather, dirt or from any other cause will not be acceptable.
- D. Store materials so as to cause no obstructions, stored off sidewalks, roadways, and underground services. The Contractor shall be responsible for protecting materials and equipment furnished under the Contract.
- E. All ductwork delivered to the site shall be temporarily sealed at both ends as required to prevent dust from entering ducts prior to installation. All installed ductwork shall remain sealed until final connections are made.

1.2 WORKMANSHIP STANDARDS

- A. Where not more specifically described in the various Sections of these Specifications, workmanship shall conform to the methods and operations of best published standards and accepted practices of the trade or trades involved, and shall include items of fabrication, construction or installation regularly furnished or required for completion (including finishes), and for successful operation as intended.
- B. Work shall be executed by mechanics skilled in their respective lines of work.
- C. When completed, parts shall have been durably and substantially built and shall present a neat, workmanlike appearance.

1.3 PRODUCT SUBSTITUTIONS

- A. See Section 01 3301 "Substitution of Materials or Products During Construction" (if applicable)

1.4 MANUFACTURER'S TRADE MARKS AND NAMES

- A. The Architect reserves the right to review and request and removal of manufacturer's trade marks and names on items or materials and equipment which will be in plain view of the occupants of the building when placed in their final position. Such removal shall be at no expense to the Owner. A decision on the necessity to remove may be obtained from the Architect, in writing. Failure to obtain such approval shall constitute agreement to comply with this requirement.

END OF SECTION

SECTION 01 6600

PRODUCT STORAGE AND PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the general requirements for storage of materials and products prior to installation and protection after installation.

1.2 GENERAL STORAGE

- A. Deliver materials to job site in manufacturer's original, unopened packaging.
- B. Store products immediately on delivery in the manner recommended by the manufacturer and in accordance with the manufacturer's printed instructions.
- C. Store products subject to damage by the elements in substantial weathertight enclosures.
- D. Arrange storage in a manner with seals and labels intact and legible. Provide access for inspection and verification of materials and quantities.
- E. Maintain temperature and humidity within the ranges required by manufacturer both during storage and prior to installation.
- F. Where materials are to be "acclimated" prior to installation ensure that manufacturer's recommended temperature and humidity levels are maintained throughout the acclimatization period.
- G. Materials that are damaged or soiled shall be removed and replaced or repaired to the satisfaction of the Owner.

1.3 EXTERIOR STORAGE

- A. Provide substantial platforms, blocking or skids to support fabricated products above the ground to prevent soiling or staining.
- B. Cover products that are subject to discoloration or deterioration from exposure to the elements with impervious sheet coverings. Provide adequate ventilation to avoid condensation.
- C. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

1.4 PROTECTION AFTER INSTALLATION

- A. Provide substantial coverings to protect installed products from damage from subsequent operations.
- B. Control traffic to prevent damage to equipment and surfaces.
- C. Cover projections, wall corners, jambs, sills and soffits of openings, in areas used for

- traffic and passage of products in subsequent work.
- D. Protect finished floors and stairs from dirt and damage.
 - E. In areas subject to foot traffic secure heavy paper, sheet goods or other materials in place over the finish flooring.
 - F. For movement of heavy products, lay planking or similar materials in place.
 - G. Cover walls and floor of elevator car, and surfaces of elevator car doors, used by construction personnel.
 - H. Finished roof surfaces shall not be used for storage, prohibit traffic of any kind except where required to carry out the Contract. In such instances install recommended protection and remove on completion of that activity.
 - I. Prohibit traffic of any kind across planted lawn and landscaped areas.
 - J. Damaged product/materials will be removed and replaced at no cost to the owner.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 7329

CUTTING AND PATCHING

PART 1 GENERAL

1.1 CUTTING AND PATCHING

- A. Structural Work: Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity of load/deflection ratio. Submit proposal and request and obtain Engineer's approval before proceeding with any cut-and-patch of structural work.
- B. Visual/Quality Limitations: Do not cut-and-patch work exposed to view (exterior and interior) in a manner resulting in noticeable reduction of visual qualities and similar qualities, as judged by Architect.
 - 1. Engage the original installer/fabricator, or (if not available) an acceptable equivalent entity, to perform cutting and patching.
 - 2. Refinish entire surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish the entire unit.
- C. Limitation on Approvals: Architect's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by the Architect.
- D. Where not more specifically described in any of the various Sections of these Specifications, workmanship shall conform to all of the methods and operations of best standards and accepted practices of the trade or trades involved, and shall include all items of fabrication, construction, or installation regularly furnished or required for completion, (including any finish), and for successful operation as intended.
- E. Work shall be executed by mechanics skilled and experienced in their respective trade, and shall have proper certification or other credentials where appropriate.
- F. In every case, exercise extreme care in cutting operations, and perform such operations under adequate supervision. Openings shall be neatly cut and shall be kept as small as possible to avoid unnecessary damage. Careless and/or avoidable cutting damage, etc., will not be tolerated, and the Contractor will be held responsible for such avoidable or willful damage.
- G. Replacing, patching and repairing of materials and surfaces cut or damaged in the execution of the Work shall be performed by experienced mechanics of the applicable trades involved. Such replacing, repairing or patching shall be done with the applicable materials, in such manner that surfaces so replaced, etc., will, upon completion of the Work, match the surrounding similar surfaces.
- H. When completed, all parts shall have been durably and substantially built and shall present a neat, workmanlike appearance.

END OF SECTION

SECTION 01 7500

STARTING AND ADJUSTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Perform operations in following order prior to request for Substantial Completion:
 - 1. Starting of Systems
 - 2. Testing, Adjusting, and Balancing
 - 3. Demonstration of systems and instruction of Owner's designated personnel.

1.2 SUBMITTALS

- A. General: Submit in accordance with Section 01 3300, Submittal Procedures.
- B. Submit following items as required by this Section:
 - 1. Testing and Balancing Report.
 - 2. Record of Owner's training/Instructions.

1.3 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions that may cause damage.
- C. Verify that tests, meter readings, and specified electrical characteristics agree with those required by contract documents and equipment or system manufacturer.
- D. Verify wiring and support components for equipment are complete and tested.
- E. Execute startup under supervision of applicable manufacturer's representatives and Contractor's personnel in accordance with manufacturer's instructions.
- F. When specified in individual Specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to startup, and to supervise placing equipment or system in operation.
- G. Verify that all waste piping is clear of obstructions and free flowing from top of vent to municipal tap.
- H. Verify that all roof drainage systems are clear of debris and free flowing from roof drain inlet to point of discharge.

1.4 TESTING, ADJUSTING, AND BALANCING (TAB)

- A. Owner will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing.

- B. TAB firm will perform services specified in Mechanical Sections prior to demonstration of system to Owner.
- C. Submit reports by TAB firm, in accordance with Section 01 3300, Submittals to Architect indicating observations and results of tests and indicating compliance or non-compliance with Contract Document requirements.
- D. Provide written record of dates that equipment was accepted after all corrections are made per the recommendations of the test and balance report. These dates will be used to establish the beginning of the warranty period for the equipment if it differs from the Substantial Completion date.

1.5 DEMONSTRATION

- A. Demonstration is for verification that systems will start and operate properly.
- B. Demonstrate systems operation to Owner's personnel prior to performing instruction of Owner's personnel.
- C. Demonstrate Project equipment by qualified manufacturers' representative who is knowledgeable about Project requirements and operation and maintenance of equipment being demonstrated.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six (6) months.
- E. Demonstrate startup, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment.
- F. Prepare and insert additional data in operations and maintenance manuals required by Section 01 7700, Closeout Procedures when need for additional data becomes apparent during instruction.

1.6 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to Substantial Completion, fully instruct Owner's designated operation and maintenance personnel in operation, adjustment, and maintenance of products, equipment and systems requiring regular maintenance. Perform instructions within continuous period of thirty (30) days. For equipment that requires seasonal operation, provide similar instruction during other seasons.
- B. Arrange and pay for services of qualified manufacturer's representatives to fully instruct Owner on specialized portions of installation, such as refrigeration machines, automatic controls, water treatment, and electrical systems.
- C. Use operations and maintenance manual as basis of instruction. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance. Include detailed review of following items:
 - 1. Maintenance manuals.
 - 2. Record documents.
 - 3. Spare parts and materials.
 - 4. Tools.
 - 5. Lubricants.
 - 6. Fuels.

- D. Submit complete record of instructions as part of operations and maintenance manual given to Owner. For each instructional period, supply following data:
1. Date.
 2. System or equipment involved.
 3. Names of persons giving instructions.
 4. Other persons present.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Requirements and procedures for submittal of pertinent data relating to closing out the Project upon completion of the Project Work. Detailed instructions elsewhere in these Specifications may require that certain items listed herein be submitted prior to Substantial Completion of the Project.
- B. Receipt and approval of items specified in this Section is a prerequisite for Final Payment and/or release of Retention.

1.2 FINAL CLEANING

- A. Perform the following special cleaning for trades at completion of Work; employing only experienced workmen or professional cleaners for the final cleaning:
 - 1. Remove marks, stains, fingerprints, soil and dirt from painted areas.
 - 2. Remove spots, soil, paint and mastic from tile work and wash same.
 - 3. Clean fixtures, equipment and piping; remove stains, paint, dirt and dust.
 - 4. Remove temporary floor protections; clean and polish (wax) floors.
 - 5. Clean concrete walks and slabs of plaster or cement droppings, paint and other objectionable materials to present a neat, clean appearance.
 - 6. Clean exterior and interior metal surfaces, including doors and windows and their frames.
 - 7. Clean items required to have a polished finish free of oil, stains, dust, dirt, paint and the like; polish and leave without fingermarks or other blemishes.
 - 8. Clean exterior surfaces of building to be free of dirt, dust, concrete, splatters, overspray, etc. Use low-pressure water stream to clean all exterior surfaces.
 - 9. Clean windows and window framing system components to be free of smears, adhesives, coatings, etc.
 - 10. Wax all V.C.T. Floors
- B. Make building(s) ready for occupancy in every respect. Lay heavy building paper in main circulation areas to protect the floors until final inspection and acceptance.
- C. Existing improvements, inside or outside the property that are disturbed, damaged or destroyed by the Work under the Contract shall be restored to the condition in which they originally were, or to the satisfaction of the Architect.

1.3 OWNER TRAINING

- A. Schedule and provide training or Owner's staff or maintenance and operation of equipment and systems provided and installed under this contract. Provide written documentation/acceptance of training prior to final closeout on form included at the end of this section. Contractor shall remain responsible for maintenance and operation of all building systems until acknowledgment of completion of Owner training.

1.4 PROJECT RECORD DOCUMENTS

- A. Record Drawings: The Contractor will provide the Architect with a complete record set of the original Construction Documents for review Construction Change Directive and Change Order items included and clearly indicated. Seals and signatures of Registrants shall be completely removed and/or permanently obscured. The following shall be provided on the Drawings, as follows:
1. Any changes from the Contract Documents, secured with prior approval of the Architect, for any phase of the Work, including all Addenda, Construction Change Directives and Change Orders shall be recorded in a neat readable manner, on the record drawings. All changes from the documents originally bid shall be made by a competent drafter and "clouded". All deletions shall be made by strike-through and clouded.
 2. For plumbing; heating, ventilating and air conditioning; electrical; and fire protection Work, Record Drawings shall be maintained by the Contractor as the Work progresses and as follows:
 - a. Deviations from the sizes, locations, and from other features of installations shown in the Contract Documents shall be recorded. Shut-off valves and other controls shall be clearly marked.
 - b. In addition, it shall be possible, using these drawings, to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the Work which will be concealed underground and/or in the finished building.
 3. Locations of underground Work shall be established by dimensions to column lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
 - a. For Work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases, this may be by dimension. In others it may be sufficient to illustrate the Work on the drawings in relation to the spaces in the building near which it was actually installed. Architect's decision in this matter shall be final.
 4. Additional drawings shall be provided as necessary for clarification.
 5. Drawings shall be kept up-to-date during the entire course of the Work and shall be available upon request for examination by the Architect and, when necessary, to establish clearances for other parts of the Work.
 6. Upon substantial completion of the Work, submit one (1) copy of the Record Drawings to the Architect for review. The Architect may request additional information be included as part of the record drawing set prior to approval. Upon approval of the Record Drawings, Contractor shall deliver the Record Drawings, together with two (2) additional sets of prints and two (2) complete copies of the Record Drawings in .pdf format to the Architect. File names shall match sheet index and drawing scale shall be such that they will fit an industry standard sheet size. The Architect shall review the Record Drawings and shall be the sole judge of the acceptability of these drawings.

1.5 OWNER'S MANUAL

- A. Upon Substantial Completion of the Project Work, submit one (1) copy of the Owner's Manual suitably typed, indexed and labeled for ready reference to the Architect for review.
1. Subcontractors, major suppliers list with company's names, addresses and telephone numbers.
 2. Guarantees/warranties: General Contractor and Subcontractor's, certifications as described in the General Conditions, Supplementary General conditions and/or

the technical specification or each item or work product (Two (2) years, unless otherwise noted).

3. AIA Documents G706, Contractors Affidavit of Payments of Debts and Claims; G706A, Contractors Affidavit of Release of Liens; and G707, Consent of Surety to Final Payment, if required.
4. "Affidavit: Non-Use of Asbestos Containing Building Materials" from General Contractor on use of asbestos-free materials, included in this Section.
5. "Materials Receipt" signed by Owner and Contractor, included in this Section
6. Special certifications and inspections documentation.
7. Finish floor elevations by a licensed surveyor.
8. Training Log or other documentation verifying system(s) training.
9. Other items required by the Specifications.

Upon acceptance of Owner's Manual document, the Contractor shall provide two (2) final hard copies, along with one (1) electronic (.pdf) file copy for transmittal to the Owner.

1.6 OPERATION AND MAINTENANCE DATA

- A. Upon Substantial Completion of the Project Work, submit one (1) copy of the Operation and Maintenance Manual and Operating Instructions including parts lists for materials, equipment and systems, electrical and control items, to the Architect for review. Divisions 21 to 28 may be contained in separate binders for each division. If required, correct and resubmit two (2) copies of the Operation and Maintenance Manuals along with two (2) electronic (.pdf) file copies to the Architect who will transmit them to the Owner. NOTE: Failure to properly complete and submit Maintenance and Operation Manuals in a timely manner shall place responsibility for detrimental maintenance and operating procedures on the Contractor.
- B. Operating instructions shall include complete operating sequence, control diagrams, description of method of operating machinery, machine serial numbers, factory order numbers, parts, tests, instruction books, suppliers phone numbers and addresses and individual equipment guarantees. Parts lists shall be complete in every respect, showing parts and part numbers for ready reference.
- C. Maintenance instructions shall include a written list of required and suggested maintenance for mechanical, plumbing, electrical or other equipment or features in the project. Each item shall contain a brief description of the maintenance required as well as the recommended time frame or period for the maintenance. Include lists of filter sizes for air handling equipment, indicated "washable" or "disposable" and for which unit the filter is for. Shut off valves, etc., must be clearly marked on as-constructed drawings.
- D. Assemble maintenance manual and operating instructions in hard back loose leaf binders. Suitably label and index material for ready reference.

1.7 CERTIFICATES AND AFFIDAVIT

- A. Certificates: Submit certificates from governing authorities, manufacturers and subcontractors not previously submitted at the time of Substantial Completion.
- B. Affidavit: Submit the completed "Non-Use of Asbestos Containing Building Materials"; this form is bound into these specifications as the last page of this section.

MATERIALS RECEIPT

DATE: _____

PROJECT: _____

O | W PROJECT NO.: _____

GENERAL CONTRACTOR: _____

I HAVE RECEIVED THE FOLLOWING EXTRA MATERIALS AS REQUIRED FOR EACH LISTED CATEGORY (*insert "N/A" to those items not in contract*).

ITEM**PROVIDED**

LANDSCAPE SPRINKLER HEADS _____

CEILING TILE _____

CARPET (BROADLOOM) (2 YDS EACH TYPE) _____

CARPET (TILE) (16 SF EACH TYPE) _____

VINYL COMPOSITION TILE (1 SF/100 SF) _____

RESILIENT FLOORING (1 SF/100 SF) _____

CERAMIC TILE (1 SF/100 SF) _____

PORCELAIN TILE (1 SF/100 SF) _____

PAINT (ONE GALLON OF EACH TYPE) _____

FIRE SPRINKLER HEADS _____

HVAC FILTERS (ONE SET) _____

HVAC BELTS (ONE OF EACH TYPE) _____

OWNER REPRESENTATIVE

NAME _____

SIGNATURE _____

DATE _____

CONTRACTOR

NAME _____

SIGNATURE _____

DATE _____

**AFFIDAVIT: NON-USE OF
ASBESTOS CONTAINING BUILDING MATERIALS**

State of Texas)

) ss:

County of Ellis)

I, _____, having
(name)

been duly sworn, depose as follows:

1. I am authorized to make this affidavit on behalf

of _____
(name of General Contractor)

who/which is the General Contractor of the _____
(project name)

2. In performing the Contract for the construction of

(project name)

I certify that no building materials containing asbestos were used or incorporated in any way in the completed project.

DATED this _____ day of _____, 20____.

(Name of General Contractor)

By _____

Its _____
(Title)

Subscribed and sworn to before me this

_____ day of _____, 20____.

Notary Public

My commission expires:

TRAINING LOG

	RESPONSIBLE PARTY	DATE PERFORMED	OWNER REP	OWNER SIGNATURE
Plant material maintenance		/	/	/
Carpet/VCT care & cleaning		/	/	/
Fire line, valves, alarms		/	/	/
Fire Alarm System		/	/	/
Fire & smoke dampers		/	/	/
Fire doors/curtains		/	/	/
Water piping and valves		/	/	/
Gas piping and valves		/	/	/
HVAC System Controls		/	/	/
HVAC Filters		/	/	/
Lighting controls		/	/	/
Roof system maintenance		/	/	/

END OF SECTION

SECTION 02 4113

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. SECTION INCLUDES:

1. Taking down, cutting away, breaking out and removing portions of the existing site to accommodate new construction.
2. Disconnecting, capping and removing identified utilities.
3. Offsite disposal and/or salvaging for reinstallation, indicated components.

B. RELATED SECTION

1. Section 01 11 00 – Summary of Work: Instructions concerning hazardous materials
2. Section 01 50 00 – Temporary Facilities and Controls
3. Section 01 77 00 – Closeout submittal

1.02 PROJECT CONDITIONS

- A. Occupancy:** Owner will occupy the buildings and will inform Contractor. Conduct demolition work in manner that will minimize need for disruption of Owner's operations.
- B. Existing Conditions:** Owner assumes no responsibility for actual condition of items or structures to be demolished. Contractor shall visit the site and verify the nature and extent of demolition required. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable.
- C. Property Protection:** Contractor shall be responsible for the protection of adjoining property, including all parts of the site outside the limits of demolition and outside the limits of the new construction. Protect buildings, paving, and utilities from damage by equipment and trucks. Various utilities are identified to be protected and remain in the drawings. Other utilities are to be protected until new services are installed.

1.03 SUBMITTAL

- A. Submit demolition and removal procedures and schedule under provisions of SECTION 01 32 16 – CONSTRUCTION PROGRESS SCHEDULES.**
- B. Submit record documents under provisions of SECTION 01 77 00 – CLOSEOUT SUBMITTALS.** Accurately record actual locations of capped utilities and subsurface obstructions.

1.04 EXISTING CONDITIONS

- A. Conduct demolition to minimize interference with adjacent portion of site to remain.**
- B. Conduct operations with minimum interference with Owner's usage of buildings.** Maintain protected egress and access at all times and maintain protected egress at fire exists as required by the Fire Marshall.
- C. Underground utilities are shown on plans based on survey and city information.** Contractor should assume there are underground utilities not shown on plans.

1.05 PROTECTION

- A. It is essential that there be minimal interruptions of existing utilities.** Any disruption of service to the

owner or adjoining properties must not be done without written notification and approval.

- B. Take care to ensure that there will be no damage to elements or portions thereof which are not required to be removed. Erect and maintain temporary shoring, bracing, and other means to safeguard the structural integrity of the existing portions of site and its parts to remain.
- C. Erect and maintain temporary bracing, shoring, lights, barricades, signs and other means to protect workers and other persons, and finishes and improvements to remain from damage; all in accordance with applicable regulatory requirements.
- D. Protect existing trees to remain. Keep area within the drip line clear of construction traffic, parking, soil contaminations, soil stockpiling, storage of materials, debris and ponding water. Locate temporary fencing around trees to remain along dripline.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable building codes for disposal of debris.
- B. Coordinate clearing Work with Owner and utility companies. Contact utility locates, which includes DIGTESS for franchise utilities and the City for public utilities
- C. Conform with applicable portions of OSHA, including 1926.604.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials designated for demolition shall become the Contractor's property; remove and dispose of such materials unless otherwise indicated or specified. Sales of salvage materials are not allowed on site.
- B. Items to remain the Owner's property will be removed by him prior to the start of demolition (or will be designated on the drawings herein or to be removed and stored by Contractor). Items not so designated shall be considered debris and shall be removed and disposed of accordingly.
- C. Carefully disconnect, remove and protect items directed by the Owner to be salvaged.
- D. Transport salvaged items to on-site storage areas designated by the Owner.

PART 3 – EXECUTION

3.01 INSPECTIONS

- A. Prior to starting demolition, make inspection and report observable defects and structural weaknesses of construction designated for demolition, of adjacent structures, and of improvements to remain. If unsatisfactory conditions exist, do not commence demolition until appropriate determinations have been made.
- B. Following demolition, make inspection and report defects and structural weaknesses of items partially demolished, cut, or removed, of adjacent structures; and or improvements remaining.

3.02 PREPARATION

- A. Prevent movement or settlement of adjacent structures. Provide bracing, shoring and underpinning as required.

- B. Protect existing appurtenances, structures and landscaping which are not to be demolished.
- C. Locate, disconnect, remove and cap designated utility lines within demolition areas.
- D. Mark location of disconnected utilities. Identify utilities and indicate capping locations on Project Record Documents.

3.03 PERFORMANCE

- A. Demolition: Carry out the work carefully and in an orderly manner to minimize noise, dust and vibration. Remove all items and parts so shown and noted on the drawings and as otherwise may be required to be removed to carry out the work.
- B. Clearing:
 - 1. Remove trees, shrubs and other vegetation from within the area of the site where new construction is to be placed. Grub out roots to a depth of at least 18 inches below natural grade. Dig out and remove buried obstructions to a depth of 24 inches below natural grade or 24 inches below the intended excavation elevation, whichever is lower. Remove existing trash, debris and abandoned facilities, which are to be removed from the site.
 - 2. Remove abandoned underground utilities from within the area of the site where new construction is to be placed. Cut and cap piping and conduit encountered below grade that is outside the limits of new construction. Relocate, outside of new construction areas, utility services for buildings to remain in operation.
 - 3. Prior to the removal of any buildings, verify all the utility services are disconnected and coordinate with the Architect on protecting any building(s) to remain.
 - 3. Clear undergrowth and deadwood, without disturbing subsoil.
 - 4. Burning debris on site is not permitted.
 - 5. Remove debris, rock, fences, and extracted plant life from site.
- C. Shoring: Provide temporary shoring wherever present supports are removed or weakened. Any settling or cracking of the existing construction due to the removal of supports and faulty or insufficient shoring shall be the responsibility of the contractor and shall be repaired at no additional expense to the Owner.
- D. Material and Equipment Disposal:
 - 1. The materials and items of equipment which are noted and shown to be salvaged and re-used in new locations or re-used for patching shall be carefully removed and safely stored until ready for reinstallation.
 - 2. Other items and all debris shall become the property of the Contractor and shall be removed from the premises entirely. Under no circumstances shall debris be allowed to accumulate.
- E. Damage: Any existing construction to be left in place which is damaged by the demolition operations shall be refinished or replaced at no additional expense to the Owner. The repair of such damage shall leave the parts in a condition at least equal to that found at the start of the work.
- F. Perform demolition in accordance with ANSI 10.6 and applicable regulatory requirements.
- G. Remove items designated for demolition within the limits of work indicated and as required to perform the work. Do not remove anything beyond the limits of demolition indicated without the prior written approval of Architect. If in doubt whether to remove an item, obtain written approval prior to proceeding.
- H. If in the event hazardous materials (asbestos, PCB's etc.) are encountered during the course of the demolition work, or if it is even suspected that such materials will or have been encountered cease work immediately in the affected area and promptly notify the Owner and Architect.
- I. Remove all building foundation systems four feet (4') minimum below existing ground.

- J. Remove all trees and associate roots to 2 feet (2') minimum below existing ground.
- K. Remove all existing underground utilities within limits of demolition. Cap utilities at property line. Call for locates and use other means as deemed necessary to locate, identify and demolish.

3.04 CUTTING

- A. Make new openings neat, as close as possible to profiles indicated and only to extent necessary for new work.
- B. At concrete paving and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and –coring equipment. Do not over-cut at corners of cut openings.
- C. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.

3.05 PIPES, DUCTS AND CONDUITS

- A. Remove deactivated mechanical, plumbing and sprinkler piping, ducts and electrical conduit, including fastenings, connections and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.
- B. Cap deactivated piping systems at points of cutoff.

3.06 CLEAN UP

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

3.07 SURVEY

- A. Provide as-built survey of any foundation systems or other underground improvement exposed but left in place. Use same control as original survey and deliver to the architect in a CAD file.

END OF SECTION

SECTION 03 0586

VAPOR BARRIER

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manufacturers.
 - 2. Vapor Barrier
 - 3. Accessories
 - 4. Finish Granular Mat Fill Materials
 - 5. End of Section
 - a. ASTM E 1643 installation requirements at end of Section.
 - b. Pipe penetration and Block-Out installation details at end of Section.
- B. Related Sections:
 - 1. Section 03 1000 – Structural Concrete Forming & Accessories: Concrete for foundations and slab and installation of Vapor Barrier.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 302.2R - Guide for Concrete Floor and Slab Construction: Vapor barrier component (plastic membrane) is not less than 10 mils thick.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D 1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 - 2. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 3. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM E 154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
 - 5. ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - 6. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
 - 7. ASTM F 1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.3 SUBMITTALS

- A. Section 01 3300 - Submittal Procedures: Requirements for submittals.
 - 1. Product Data: Provide data on specified products, describing physical and performance characteristics.
 - a. Performance: Only Vapor Barrier products with a Water Vapor Transmission Rate of 0.01 perms and lower when tested in accordance with ASTM F 1249.
 - 2. Shop Drawings: Provide vapor barrier installation drawings indicating roll installation direction, seaming and penetration seal details at plumbing, electrical and structural penetrations, and method of installation at perimeter footing, interior footings, piers and grade beams.

- B. Section 01 7700 - Closeout Procedures: Procedures for closeout submittals.
 - 1. Installation Certification: Submit written certification of installation on form located at end of Section.

1.4 QUALITY ASSURANCE

- A. Conform to the requirements of ACI 302.2R
- B. Installer Qualifications: Company specializing in performing under slab vapor barrier installations experienced in use of specified projects with minimum five (5) years documented experience in under slab vapor barrier installation.
- C. Manufacturer Regional Representative: Manufacturer representative shall be on-site the day of vapor barrier placement to instruct contractor in proper vapor barrier system installation, document installation and verify that proper procedures are followed.
- D. Manufacturer Installation Instructions: Contractor shall maintain current copy of vapor barrier manufacturer published installation instructions in Project Field Office and refer to installation instructions at all times during installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 6000 - Product Requirements: Transport, handle, store, and protect Products.
- B. Deliver vapor barrier in rolls in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Deliver Material Safety Data Sheet (MSDS) for each material to Project Field Superintendent for Contractor Records.
- D. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- E. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.
- F. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements: Granular mat and building sub-grade pad area shall be thoroughly dry and free of moisture before installation of vapor barrier.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for Vapor Barrier is based upon the product named.
 - 1. Stego Industries, LLC: www.stegoindustries.com.

- B. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
 - 1. Poly-America, Yellow Guard; www.yellowguard.com.
- C. Section 01 6000 - Product Requirements: Product options and substitutions.
 - 1. Substitutions: Permitted.

2.2 VAPOR BARRIER

- A. Product: Stego Wrap Vapor Barrier.
- B. Description:
 - 1. Material: 15 mil geo-membrane consisting of extruded, multi-layer plastic of prime, virgin, polyolefin resins.
 - 2. Size: 14-foot-wide x 140-foot-long rolls.
 - 3. Color: Yellow.
- C. Physical Properties:

<u>Characteristic</u>	<u>Property</u>	<u>Test Method</u>
Classification	Exceeds Class A	ASTM E 1745
Tensile Strength	76.6 pounds/inch	ASTM E 882
Puncture Resistance	Minimum 2445 grams	ASTM D 1709 Method B
Permeance	0.01 U.S. Perms or lower	ASTM E 96 or ASTM 1249
Conditioning	Maintain permeance of less than 0.01 Perms after mandatory conditioning test in accordance with ASTM E 154	

2.3 ACCESSORIES

- A. Joint Seam Tape:
 - 1. Product: Stego Seam Tape/Stego Cold Weather Tape.
 - 2. Description:
 - a. Heavy duty weather resistant polyethylene backing with non-staining, clean removal rubber adhesive.
 - b. 4 inch x 180 foot roll.
 - c. Water vapor transmission rate of 0.3 perms or lower when tested in accordance with ASTM E 96.
 - 3. Concrete Tape: Stego Crete Claw Tape, 6-inch or 3-inch x 180 feet, 26 mils thick.
- B. Vapor Proofing Mastic:
 - 1. Product: Stego Mastic.
 - 2. Description:
 - a. Waterproofing and vapor retardant mastic composed of medium-viscosity, water-based, polymer-modified anionic bituminous/asphalt emulsion with bonding, elongation and water-proofing characteristics.
 - b. Water vapor transmission rate of 0.3 perms or lower when tested in accordance with ASTM E 96.
- C. Pipe Boots: Constructed from vapor barrier material, pressure sensitive tape and/or mastic.
- D. Double-Sided Tape:
 - 1. Product: StegoTack (Double-Sided) Tape.

2. Description: Adhesive strip, 30 mils thick x 2-inch-wide x 50', used to bond Barrier to substrate; concrete, masonry wood.

E. Perimeter and Edge Seals:

1. Product: Stego Crete Claw.

2.4 FINISH GRANULAR MAT FILL MATERIALS

A. Granular Fill Mat Under Floor Slab: Inspected and approved by Independent Testing Laboratory.

1. Gravel, free of sharp corners or edges, natural stone; washed, free of clay, shale, organic matter; 1/4-inch minimum size, 5/8-inch maximum size.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 1. Verify that all underground pipes, conduits, floor drains and other penetrations are in place.
 2. Verify that underslab pad preparation work is complete and pad is dry and free of moisture.
- B. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Level, tamp or roll granular mat.

3.3 ADVANCE NOTIFICATION TO MANUFACTURER REGIONAL REPRESENTATIVE

- A. Advance Notification: Contractor shall notify Manufacturer Regional Representative seven (7) days in advance of date scheduled for start of vapor barrier installation to coordinate schedule for arrival of Manufacturer Regional Representative at project site in sufficient time to instruct installation personnel in proper installation of vapor barrier and seals around penetrations.
- B. Confirmation Notification: Contractor shall contact Manufacturer Regional Representative minimum 48 hours before start of installation to confirm or reschedule the arrival date and time.

3.4 INSTALLATION

- A. Install vapor barrier when weather is dry. Vapor barrier installation not permitted during rain or when granular mat or building area sub-grade pad is wet. After rain, allow granular mat and building area subgrade pad to thoroughly dry before installing vapor barrier.

- B. Install vapor barrier on top of granular mat in accordance with manufacturer's published instructions and ASTM E 1643.
- C. Unroll vapor barrier with longest dimension parallel with direction of concrete pour and pull out folds. Overlap vapor barrier joints minimum 6 inches and seal with joint seam tape.
- D. Clean and dry vapor barrier before sealing.
- E. Seal all penetrations with sealingtape.
- F. Lap vapor barrier over footings and seal to vertical foundation wall with two-sided tape. Seal around pipes, structural columns or any other penetration with an elastomeric sealant to create a monolithic membrane between surface of slab and moisture sources below and at slab perimeter.
- G. Fabricate pipe boots and fasten with double sided tape and joint seam tape.
 - 1. Cut piece of vapor retarder 2-foot x 2-foot for base. Cut an "X" to 75 percent of outside diameter of pipe.
 - 2. Force base over pipe and tape perimeter with joint seamtape.
 - 3. Seal vapor barrier to pipe using joint seamtape.
- H. No penetration of vapor barrier permitted except for reinforcing steel (where applicable) and permanent utilities.
- I. All damaged areas shall be repaired by cutting patches of vapor barrier, overlapping damaged are 6 inches minimum and taping all four side with jointseam tape.
- J. Aggregate Fill Under Slab-On-Grade:
 - 1. Provide granular fill mat under floor slab, thickness as indicated on Drawings.
- K. Perimeter and Edge Seals:
 - 1. Product: Stego Crete Claw. Follow manufacturer's recommended installation procedures.
 - a. Clean surfaces of barrier to provide a moisture and debris free surfaces prior to installation of tape.
 - b. Overlap barrier seams a minimum of 6 inches. Seal each seam with tape.
 - c. Install tape at perimeter of entire slab.
 - d. Note: Prior to placement of concrete, inspect each seam to make sure tape has been properlyplaced and remains clean and free of debris.

3.5 FIELD QUALITY CONTROL

- A. Section 01 4500 - Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 - 1. Inspect installation of vapor barrier, pipe boots, penetration sealing and tear sealing.
 - 2. Inspect under slab vapor barrier installation, verify that pipes, conduits, floor drains and other penetrations have been sealed and lap seams taped in conformance with ASTM E 1643 and manufacturers published instructions.
 - 3. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 4. Test and Inspection Reports shall be available to Architect upon request.

- B. Manufacturer's Field Services:
 - 1. Provide technical assistance and guidance for installation of under-slab vapor barrier system.
 - 2. Inspect installation and certify that product has been furnished and installed in accordance with manufacturer's published instructions.
 - a. Prepare and submit inspection report for each inspection made.
- C. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

3.6 PROTECTION

- A. Use of screed pins penetrating installed vapor barrier not permitted. Use screed system that will not puncture vapor barrier.
- B. Protect vapor barrier until placement of concrete. Punctures or tears of vapor barrier must be repaired in compliance with manufacturer's specifications.
- C. Protect vapor barrier from any punctures or tears from the use of laser-screed concrete leveling machine or any other machinery. Do not permit laser-screed concrete leveling machine or any other machinery to maneuver or roll directly on vapor barrier where such use will puncture vapor barrier.
 - 1. Driving machinery over vapor barrier not permitted.
- D. Cover vapor barrier shortly after completion of installation. Keep vapor barrier exposure to a minimum.

END OF SECTION

VAPOR BARRIER INSTALLATION CERTIFICATION

PROJECT: _____

LOCATION: _____

ARCHITECT'S PROJECT NUMBER: _____

OWNER: _____

CONTRACTOR: _____

VAPOR BARRIER INSTALLER:

Name: _____

Address: _____

Telephone Number: _____

UPON COMPLETION OF INSTALLATION INSTALLER CERTIFIES THAT:

1. Installer obtained a current copy of the manufacturer's published installation instructions for the specific product being installed.
2. Installer reviewed and discussed manufacturer's published installation instructions and requirements of ASTM E1643 with Project Field Superintendent before start of installation.
3. Installer furnished and installed specified 15 mil thick vapor barrier system in accordance with the Contract Documents. Vapor barrier was installed on top of granular mat.
4. Installer has sealed around all penetrations and has inspected, repaired and sealed any and all tears or punctures as per manufacturer's published instructions.
5. Installer installed vapor barrier system in conformance with vapor barrier manufacturer's published installation instructions.

EXECUTED AND DELIVERED this _____ day of _____, 20____.

(Company name)

BY: _____
(Authorized

signature) Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission
expires:

Affix Seal

END OF CERTIFICATION

03 0586.7



All patches must cover damaged area by 6" on all sides.

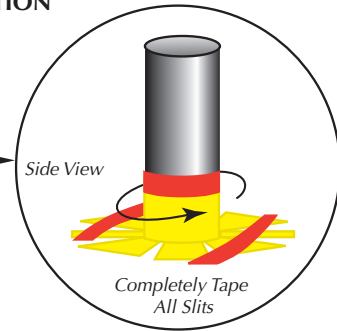
DAMAGED AREA

STEGO® TAPE

BLOCKOUT

PIPE PENETRATION

FIGURE TWO

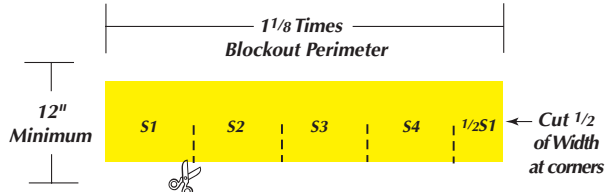
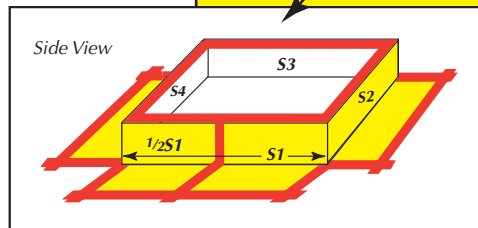
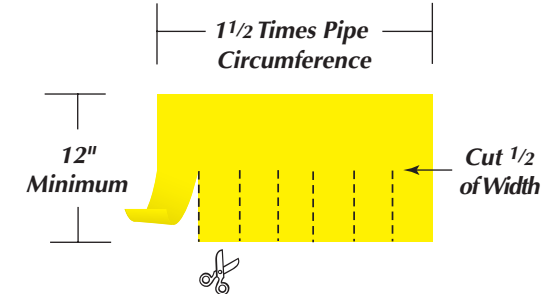
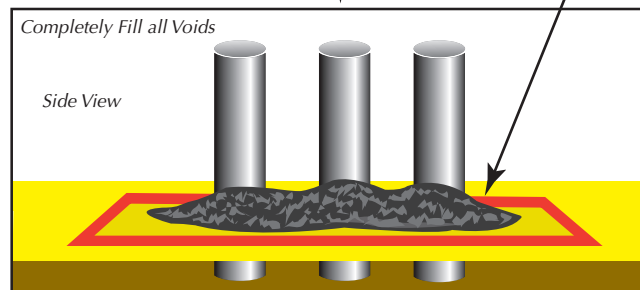


PIPE PENETRATION CONSTRUCTING A PIPE BOOT FROM STEGO WRAP

- 1) Cut a piece of Stego Wrap.
Width: Minimum 12"
Length: $1\frac{1}{2}$ times the pipe circumference
- 2) With scissors, cut slits half the width of the film.
- 3) Wrap boot around pipe as shown; tape onto pipe and completely taping the base to Stego Wrap barrier using Stego Tape.

PIPE PENETRATION ALTERNATE

STEGO® MASTIC



BLOCKOUT CONSTRUCTING A BLOCKOUT BOOT FROM STEGO WRAP

- 1) Cut a piece of Stego Wrap.
Width: Minimum 12"
Length: $1\frac{1}{8}$ times perimeter of blockout
• $(S1 + S2 + S3 + S4 + \frac{1}{2} S1)$
- 2) With scissors, cut flaps half the width of the film at the corners of each side of the blockout.
- 3) Wrap the boot around the blockout as shown; tape the overlap, tape the film onto the top of the blockout and completely tape the flaps to Stego Wrap barrier using Stego Tape.

PIPE PENETRATION ALTERNATE USING STEGO MASTIC TO SEAL PIPES

- 1) Cut out a small area around pipes.
- 2) Cut a patch of Stego Wrap extending at least 6" past the cut out in all directions.
- 3) Cut X's or small circles in the patch and install over pipes.
- 4) Overlap at least 6" and tape with Stego Tape.
- 5) Build up 40-60 mils of mastic, or as needed to completely fill all voids between the pipe and Stego Wrap.
- 6) Allow 24 hours for maximum cure before concrete pour.

SECTION 03 1000

STRUCTURAL CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Furnish, install and removal of concrete formwork.

1.2 REFERENCES

- A. Codes and Specifications
 - 1. American Concrete Institute (ACI)
 - a. ACI 117, Specification for Tolerances for Concrete Construction and Materials
 - b. ACI 301, Specifications for Structural Concrete
 - c. ACI 318, Building Code Requirements for Structural Concrete
 - d. ACI 347R, Guide to Formwork for Concrete
 - 2. Concrete Reinforcing Steel Institute (CRSI)
 - a. Manual of Standard Practice
 - 3. American Society for Testing Materials (ASTM)
 - a. ASTM C203, Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
 - b. ASTM D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics
 - c. ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

1.3 SUBMITTALS

- A. Product Data:
 - 1. Fiberboard void forms
 - 2. Void retainer panels
 - 3. Vapor barrier

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials off ground and protected from weather.
 - 1. Prevent warpage, twisting and excessive moisture gain of wood materials.
 - 2. Discard damaged or deformed materials.
- B. Protect smooth faces of form liner materials from abrasion, denting or scarring during handling.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Design, erect, shore, brace and maintain formwork according to ACI 301 to withstand vertical, lateral, static, dynamic and construction loads applied prior to concrete structure reaching adequate strength to support such loads.
- B. Limit form deflections to provide smooth, straight surfaces without unsightly bulges and deformations.
- C. Limit form deformations for architecturally exposed surfaces to 0.0025 times the span of each component (facing material, studs and walers).

2.2 MATERIALS

- A. Wood forms for unexposed concrete surfaces: No. 2 Southern Yellow Pine or Douglas Fir dressed to uniform and smooth contact surfaces.

- B. Wood forms for concrete surfaces exposed to view: Commercial Standard Douglas Fir concrete form plywood, moisture resistant, not less than 5 plies, and minimum thickness of 9/16 inch. Line forms with one of the following:
 - 1. Plywood: Commercial Standard Douglas Fir, concrete form, exterior, 3 ply, not less 1/4 inch thick with one smooth face.
 - 2. Fiberboard: Treated, hard pressed fiberboard, moisture resistant, not less than 3/16 inch thick with one smooth side.
- C. Void retainers:
 - 1. Lightweight, ribbed, high density polyethylene panels specially made to prevent migration of backfill soil under foundation elements. Required minimum panel height: 14 inches for 8 inch void space and smaller.
 - a. Example product: SureRetainer by VoidFormProducts, Englewood, CO

2.3 COMPONENTS

- A. Rustications: steel, polyvinyl chloride or milled and sealed white pine.

2.4 MANUFACTURED UNITS

- A. Fiberboard void forms (void boxes): manufactured using corrugated paper material with water resistant fiberboard material exterior, capable of supporting weight of wet concrete without crushing but non-durable in long-term (deteriorates over time with absorption of moisture). Void forms to be laminated using moisture resistant adhesive.
 - 1. Provide pre manufactured shapes required
 - 2. Provide special shapes adjacent to round or skewed components.
 - a. Do not cut fiberboard void forms in field.
 - 3. Provide caps at each end of units.
 - 4. Provide a layer of protective cover board over void forms to distribute working load and protect void forms from puncture and other damage during concrete placement.
 - a. Example cover board: 1/4 inch minimum thickness hardboard/fiberboard
- B. Vapor barrier:
 - 1. Vapor Barrier membrane must have the following properties:
 - a. Permeance as tested after mandatory conditioning (ASTM E154) less than 0.01 perms
 - b. Strength: ASTM E1745-17
 - c. Thickness: 15 mils minimum

2.5 ACCESSORIES

- A. Form ties: bolt rods or patented devices of sufficient strength to withstand pressure due to wet concrete (3000 pounds minimum tensile strength); adjustable in length, and removable to depth of at least 1 inch from face of concrete.
 - 1. Equip ties for exposed concrete surfaces with plastic cones 5/8 inch in diameter.
 - 2. Do not use wire ties, or makeshift ties that leave unsightly marks or depressions on face of concrete.
- B. Form release agent:
 - 1. Does not bond with, stain, or adversely affect concrete surfaces.
 - 2. Meets acceptable air quality standards.

PART 3 - EXECUTION

3.1 DESIGN AND CONSTRUCTION

- A. Design formwork for concrete elements to have correct dimension, shape, alignment, elevation, and position with dimensional tolerances conforming to ACI 117. Reference ACI 347R.
- B. Design formwork to safely support vertical and lateral loads until such loads can be supported by concrete structure. Carry vertical and lateral loads to ground by formwork system or by in-place construction of adequate strength.
- C. Form sides of concrete elements unless specifically noted or shown otherwise in the Contract Documents.

1. Dimensional tolerances to conform to ACI 117.
2. Repair bulges, offsets and formwork conditions that would cause beam sides to become skewed or wider than void box bottom forms prior to placing concrete.
- D. Construct forms to required shapes, lines and dimensions; provide necessary studs, walers, ties, centering, molds and supports.
 1. Install forms sufficiently tight to prevent leakage of mortar.
 2. Construct forms to be easily removable without damage to finished surfaces.
 3. Provide forms without unsightly marks or deformations on exposed faces.
 4. Thoroughly clean forms of concrete laitance before re-use.
 5. Provide clean-outs at base of vertical forms for removal of foreign materials before concrete placement.
- E. Tying of forms: provide sufficient form ties to prevent bulging or collapse of forms under weight of wet concrete.
 1. Place ties in uniform and orderly pattern.
 2. Lubricate ties to prevent bonding with concrete.
- F. Special features: place in forms any wood strips, blocking, molding, and liners necessary to produce required shapes.
 1. Attach feature strips to forms in a manner that will not leave unsightly marks on exposed concrete surfaces.
 2. Coat wood strips, blocking and molding with form sealer.
 3. Provide 3/4 inch chamfer strips along edges of permanently exposed concrete unless noted otherwise in Contract Documents.
- G. Coatings:
 1. Coat contact surfaces of wood forms with form release agent before each use and before placing reinforcement.
 2. Apply form release agent per manufacturer's recommendations.
 3. Do not allow excess release agent to accumulate in forms or to contact hardened concrete against which fresh concrete will be placed.
 4. Remove release agent from reinforcement before placing concrete.
- H. Construction joints:
 1. Locate construction joints as shown on approved submittals.
 - a. Locate construction joints in beams and slabs approximately at midspan between supports.
 - b. Provide plumb and level construction joints. Avoid irregular lines at horizontal construction joints in exposed concrete faces by tacking a continuous strip of dressed lumber, 1 inch thick, to inside of wall or grade beam form, with its lower edge at line of construction joint. About one hour after placing concrete in lower part of wall or grade beam, remove strip, level off irregularities in joint line with wood float and remove laitance.
 - c. Provide shear keys and waterstops as required in construction joints.
- I. Fiberboard Void Boxes:
 1. Ensure subgrade is clean and dry before installing void boxes.
 2. Place void cartons tightly end-to-end.
 3. Place and arrange void cartons so that horizontal concrete surfaces that would otherwise be in contact with soil are protected by void boxes. Protect cartons from rain and mud.
 4. Secure void cartons firmly in place so that position will not be altered by activities of workmen or placement of concrete. Secure with waterproof tape.
 5. Do not cut fiberboard void box components in field.
 6. Replace partially or wholly collapsed cartons.
 7. Install vapor retarder in accordance with ASTM E1643
 8. Install protective cover board according to manufacturer's instructions.
- J. Void Retainers:
 1. Prior to installing retainers, inspect void spaces to ensure voids are intact and that concrete or other material has not entered void space.
 - a. Where void space is not intact, remove excess concrete or other material prior to installing void retainers.

2. Install void retainers as shown in Contract Documents or in accordance with manufacturer's written instructions, including overlap on side of beam or wall and penetration into subgrade. Where discrepancies occur, the most stringent shall govern.
3. Cut retainer material for tight fit at corners. Tape corners to ensure panels remain accurately in place during backfilling and that backfill soil does not enter void space.
4. Monitor performance of retainer panels continuously during backfilling. If panels shift, or soil enters void space, stop work and adjust installation to assure satisfactory performance.
5. Void height tolerance: plus 2 inches, minus 0 inches of height shown in Contract Documents.

3.2 REMOVAL OF FORMS

- A. Remove forms completely.
- B. Remove forms carefully to avoid damage to concrete surfaces.
- C. Do not remove forms until concrete is adequately set.
 1. Clamps and tie rods may be loosened after 24 hours following placement of concrete.
 - a. Maintain sufficient ties to hold forms in place.
 - b. Withdraw through-wall ties toward the inside (or unexposed) face of walls and beams.
 - c. Prevent spalling during tie removal.
 2. Use concrete strength tests as evidence that concrete has adequately set for form removal.
 - a. Minimum strength is 75 percent of design strength.
- D. Remove forms sequentially and in small units to prevent shock, overload or undue eccentricity in structure. Do not store materials or place heavy equipment on structures of which forms have been removed unless concrete strength is equal to design strength, or re-shores are installed. Remove forms in a manner that does not require a large portion of the structure to be self-supporting (i.e. a full bay of framing). Install re-shores immediately as form removal progresses.
- E. Do not remove forms until supporting structures are permanently in place and full strength.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Preparation of shop drawings
 - 2. Fabrication and placement of reinforcing
- B. Products Furnished, not Installed Under This Section
 - 1. Pier reinforcing

1.2 REFERENCES

- A. Codes and Specifications
 - 1. American Concrete Institute (ACI)
 - a. ACI 318, Building Code Requirements for Reinforced Concrete
 - b. SP-066, ACI Detailing Manual
 - 2. Concrete Reinforcing Steel Institute (CRSI)
 - a. Manual of Standard Practice
 - 3. American Welding Society (AWS)
 - a. AWS D1.4, Structural Welding Code - Reinforcing Steel
 - 4. American Society for Testing Materials (ASTM)
 - a. ASTM A1064, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - b. ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - c. ASTM A706, Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

1.3 SUBMITTALS

- A. Shop Drawings
 - 1. Submit shop and installation drawings for review by Architect, including:
 - a. Reinforcing sizes and quantities
 - b. Reinforcing lengths and bending details
 - c. Placement instructions
 - d. Details and spacing of reinforcing supports
 - e. References to reinforcing designations in Contract Documents
 - f. Notes regarding reinforcing placement in Contract Documents
 - 2. Review of Shop Drawings will be for reinforcing sizes, spacing, and general detail only; excluding quantities, lengths and fit of materials.
 - 3. Do not use reproductions of Contract Documents for shop drawings.
- B. Quality Control Submittals
 - 1. Submit certified mill reports, evidencing compliance with Specification requirements.
 - 2. Submit laboratory testing and inspection reports.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in tagged bundles grouped by reinforcing size and length.
- B. Store reinforcing on skids off ground and stacked to permit drainage. Prevent build-up of rust and dirt on reinforcing. Protect reinforcing from contamination that would prevent bonding of concrete.
- C. Do not bend, twist or warp reinforcing during handling.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcing Steel
 - 1. Deformed bars: new billet steel conforming to ASTM A615 of required grades.
 - 2. Smooth bars: conform to ASTM A615
 - 3. Welded wire reinforcement: conform to ASTM A1064.
 - 4. Reinforcing bars to be welded: conform to ASTM A706.

2.2 ACCESSORIES

- A. Concrete bricks or chairs with bearing plates: Provide where supports are in contact with soil or vapor barrier.

2.3 FABRICATION

- A. Shop Fabrication
 - 1. Cut reinforcing to required lengths
 - 2. Bend reinforcing cold with suitable equipment. Do not heat or stretch material. Provide bend radii and extensions in conformance with ACI 318.
 - 3. Do not use reinforcing with kinks or unrequired bends.
 - 4. Do not re-straighten reinforcing bent more than 30 degrees.
- B. Tolerances: conform to ACI 318.
- C. Marking: mark reinforcing to correspond with shop drawings.

2.4 SOURCE QUALITY CONTROL

- A. Testing Laboratory Services
 - 1. Inspect fabricating and bending procedures
 - 2. Inspect fabricated materials

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean reinforcing of ice, dirt, loose rust, mill scale, oil, and grease.

3.2 PLACEMENT

- A. Place reinforcing of required sizes and quantities in proper position. Use sufficient supports and spacers to maintain position during concrete placement.
 - 1. Do not place reinforcing supports against exposed faces of beams, walls or copings.
- B. Secure reinforcing in position with wire ties complying with ACI 318.
 - 1. Clip or bend tails of tie wire away from exposed faces, do not leave tie wire within 1 1/2" of any exposed surface.
- C. Concrete Cover: comply with ACI 318 and Contract Documents.
- D. Maintain position of reinforcing mats in walls with metal spacers between mats.
- E. Tolerances
 - 1. Concrete cover to unformed surfaces
 - a. Members 8 inches deep or less: plus 1/4 inch
 - b. Members more than 8 inches deep: plus 1/2 inch
 - 2. Concrete cover to formed surfaces: plus 1/4 inch
 - 3. Longitudinal location of bends and ends of reinforcement: plus 2 inches
 - 4. Spacing between reinforcing bars: 1/4 inch
- F. Support reinforcing in slabs-on-grade on bolsters or blocks. Do not lift reinforcing during concrete placement.

3.3 COLD BENDING OF BARS IN FIELD

- A. Dowels connecting concrete of different pour sequences may be bent in field to facilitate form placement and removal with the following conditions:

1. Maximum bar size is #5
2. Maximum bend angle is 90 degrees
3. Bars may be bent and straightened one time only

3.4 FIELD QUALITY CONTROL

- A. Testing Laboratory Services
 1. Inspect reinforcing sizes, quantities and placement.
 2. Inspect support and securement of reinforcing.
 3. Inspect condition of reinforcing.

END OF SECTION

SECTION 03 3100

STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Design of concrete mixes
 - 2. Furnishing and placing cast-in-place concrete
 - 3. Curing and finishing of concrete
 - 4. Waterstops
 - 5. Non-shrink grout
- B. Products Furnished, not Installed, under this Section
 - 1. Concrete for drilled piers

1.2 REFERENCES

- A. American Concrete Institute (ACI)
 - 1. ACI 117, Specification for Tolerances for Concrete Construction and Materials
 - 2. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
 - 3. ACI 214, Guide to Evaluation of Strength Test Results of Concrete
 - 4. ACI 301, Specifications for Structural Concrete
 - 5. ACI 302.1, Guide to Concrete Floor and Slab Construction
 - 6. ACI 304, Guide for Measuring, Mixing, Transporting, and Placing Concrete
 - 7. ACI 305.1, Specification for Hot Weather Concreting
 - 8. ACI 306.1, Standard Specification for Cold Weather Concreting
 - 9. ACI 308, Guide to External Curing of Concrete
 - 10. ACI 309, Guide for Consolidation of Concrete
 - 11. ACI 318, Building Code Requirements for Structural Concrete and Commentary
 - 12. MNL-15, Field Reference Manual
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C31, Standard Method of Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33, Standard Specification for Concrete Aggregates.
 - 3. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. ASTM C42, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 5. ASTM C94, Standard Specification for Ready-Mixed Concrete.
 - 6. ASTM C138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
 - 7. ASTM C143, Standard Test Method for Slump of Portland Cement Concrete.
 - 8. ASTM C150, Standard Specification for Portland Cement.
 - 9. ASTM C156, Standard Test Method for Water Retention by Concrete Curing Materials.
 - 10. ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
 - 11. ASTM C172, Standard Method of Sampling Fresh Concrete.
 - 12. ASTM C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 13. ASTM C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 14. ASTM C260, Standard Specification for Air- Entraining Admixtures for Concrete.
 - 15. ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 16. ASTM C494, Standard Specification for Chemical Admixtures for Concrete.
 - 17. ASTM C618, Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

18. ASTM C989, Standard Specification for Slag Cement for Use in Concrete and Mortars.
 19. ASTM C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 20. ASTM C1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
 21. ASTM C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
 22. ASTM C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 23. ASTM C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
 24. ASTM E1155, Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System (Inch-Pound) Units.
 25. ASTM E1745, Standard Specification for Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- C. Corps of Engineers (CRD)
1. CRD-C13, Standard Specification for Air- Entraining Admixtures for Concrete.
 2. CRD-C572, Specifications for Polyvinyl Chloride Water Stops.
 3. CRD-C621, Corps of Engineers Specification for Non-Shrink Grout.

1.3 SUBMITTALS

- A. Product Data: submit manufacturer's data indicating product compliance for the following:
1. Admixtures
 2. Floor hardener
 3. Curing compound
 4. Curing and Sealing compound
 5. Vapor Barrier
 6. Waterstops
 7. Non-shrink grout
- B. Material Certifications: submit certifications showing compliance for the following:
1. Portland cement
 2. Fly ash
 3. Slag cement
 4. Sieve analyses for structural concrete aggregates:
 - a. Coarse aggregate
 - b. Fine aggregate
- C. Structural Concrete Mix Designs for each class of concrete
- D. Concrete Delivery Tickets: Submit sample ready-mixed concrete delivery tickets in accordance with ASTM C94 for each class of concrete.

1.4 QUALITY ASSURANCE

- A. Batch Plant Qualifications: Conform to National Ready-Mixed Concrete Association certification requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Transporting: Ready-mixed concrete supplier to have sufficient capacity and adequate facilities to provide continuous delivery at rate required for continuous placement throughout sequence of placement.
- B. Storage of Materials
1. Store cement in weather tight buildings or bins which prevent intrusion of moisture or contaminants. Store different types of cement in separate facilities.
 2. Stockpile aggregates to prevent segregation and contamination with other materials. Thaw frozen aggregates before use.
 3. Drain sand to uniform moisture content before use.
 4. Store admixtures securely to prevent contamination, evaporation, damage or temperature

- variation in excess of range recommended by manufacturer.
5. Store waterstops under cover to prevent exposure to sunlight, moisture, soil and other deleterious materials.
- C. Delivery: Truck mixers, agitators and non-agitating units: Conform to ASTM C94

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Ardex Americas
- B. Dayton Superior
- C. Euclid Chemical Company
- D. W.R. Grace & Company
- E. SpecChem
- F. BASF
- G. W.R. Meadows
- H. Sika Corporation
- I. Sonneborn

2.2 MATERIALS

- A. Cementitious materials
 1. Portland cement: Conform to ASTM C150, Type I, II or III Portland Cement.
 2. Fly Ash: Conform to ASTM C618, carbon content not greater than 3 percent by volume.
 3. Slag Cement: Conform to ASTM C989.
- B. Fine aggregate: Conform to ASTM C33, natural bank or river sand, washed and screened, consisting of hard, durable, uncoated particles free of deleterious matter, and graded from coarse to fine to produce a minimum percentage of voids.
- C. Coarse aggregate: Conform to ASTM C33, gravel or crushed stone, suitably processed, washed and screened; consisting of hard, durable particles without adherent coatings.
- D. Water: Conform to ASTM C1602.
- E. Admixtures: Conform to ASTM C494, Type A through G, and used strictly in accordance with manufacturer's recommendations.
- F. Air Entraining Admixtures: Conform to ASTM C260 and CRD-C13.
- G. Calcium chloride thiocyanates or admixture containing more than 0.05 percent chloride ions not permitted in concrete mixtures.

2.3 CURING AND FINISHING PRODUCTS

- A. Liquid Curing Compound
 1. Conform to ASTM C309, Types 1 and 1D, Class B
 2. Meet federal and state VOC/AIM regulations.
 3. Dissipating resin type, which chemically breaks down after approximately 8 weeks.
 4. Does not inhibit bonding of flooring adhesives.
 5. Does not inhibit bond breaker, where applicable.
 6. Sodium silicates prohibited.
 7. Use on interior slabs receiving subsequent floor coverings and parking structures.
- B. Curing and Sealing Compounds:
 1. Conform to ASTM C1315, Type 1, Class A.
 2. Minimum 25 percent solids by volume.
 3. Moisture loss not more than 0.30 Kg/M2 when applied at 300 square feet per gallon.
 4. Meet federal and state VOC/AIM regulations
 5. Do not use in tilt-up construction
- C. Evaporation Retardant:
 1. Thin, continuous film which prevents rapid moisture loss from concrete surface.
 2. Use in concrete operations performed in direct sun, wind, or high temperatures.
- D. Abrasive Aggregate: aluminum oxide aggregate
- E. Floor Hardener:

1. Penetrating liquid for subsequent application
 2. Non-staining
 3. Combination curing compound and hardener not permitted.
- F. Cement Floor Leveling Compound: Free flowing, self-leveling, pumpable, cementitious compound specially formulated for feather-edge application.
- G. Liquid Densifier / Sealer:
1. Silicate based sealer that penetrates concrete surfaces, increases abrasion resistance, and provides a "low sheen" surface.
 2. Clear, non-yellowing, fast curing, chemically neutral, without oils, fillers, extenders and stabilizers.
 3. Does not inhibit bonding of flooring adhesives.
 4. Does not inhibit bond breaker, where applicable.
- H. Comply with applicable air-quality and environmental regulations.

2.4 MISCELLANEOUS PRODUCTS

- A. Waterstops:
1. Bulb Type Waterstops
 - a. Flexible PVC (polyvinyl chloride) extruded from elastomeric plastic material of which basic resin is prime virgin polyvinyl chloride containing no scrap material, reclaimed material or pigment; ribbed, with center bulb and 3/8 inch thickness at base, 6 inch long cross-section. Example product:
 - 1) Greenstreak/Sika #705
 - 2) Southern Metals #15RCB
 - 3) Vinylex #RB638
 - b. Provide factory made waterstop fabrications for changes of direction, intersections, and transitions, leaving only straight butt joint splices for field.
 - c. Provide grommets, pre-punched holes, or hog rings spaced at 12 inches on center along length of waterstop.
 - d. Provide Teflon-coated thermostatically controlled waterstop welding irons for field butt splices.
 2. Adhered Waterstops
 - a. Strip-applied waterstop comprised of a single component, self-sealing mastic. Example product:
 - 1) Greenstreak/Sika Lockstop
 - 2) Southern Metals Stop-Tite
 - 3) Vinylex UltraStop
 - 4) Synko-Flex SF302
 - b. Provide manufacturer's compatible primer adhesive to secure waterstop to concrete
 - c. When required, provide concrete nails in addition to primer adhesive to secure waterstop in vertical applications.
- B. Non-Shrink Grout:
1. Pre-mixed, non-shrinking, high strength grout
 2. Compressive strength in 28 days: 5000 psi minimum at 28 days, but not less than specified strength of base concrete.
 3. Conform to ASTM C1107 and CRD-C621.
 4. Non-oxidizing if permanently exposed to view
 5. Exhibits positive expansion when testing in accordance with ASTM C1090.
 6. Example products:
 - a. Euco N-S Grout, manufactured by Euclid Chemical Co.
 - b. Masterflow 713, manufactured by Master Builders Co.
 - c. SikaGrout 212, manufactured by Sika Corporation.

2.5 CONCRETE MIXES

- A. General: Compose concrete of cementitious materials, fine aggregate, coarse aggregate, water, and admixtures where applicable. Design concrete mixes to be workable and

appropriate for each application, to bond readily to reinforcement, without segregation or formation of excessive free water on surfaces.

B. Strength Gain: design concrete mixes to obtain required strength in 28 days or less from date of placement.

C. Selection of Proportions

1. Determine ingredient proportions in accordance with ACI 301 to provide required strength, slump, resistance to weathering, placeability, durability and surface hardness for each class of concrete.
2. Provide admixtures as required or appropriate to enhance workability, control set or improve strength.
3. Minimum Cement Content: Cement content not less than 320 pounds per cubic yard
4. Supplementary cementitious materials (fly ash and slag cement)
 - a. Percentage of supplementary cementitious materials not to exceed 25 percent of total cementitious content by weight
 - b. Fly ash not permitted in architecturally exposed concrete
 - c. Supplementary cementitious materials not permitted in concrete receiving dry shake floor hardeners

D. Required Average Strength for Mix Design:

1. Where suitable strength test records for concrete production facility are available, design strength may be based on standard deviation in accordance with ACI 301.
2. Where strength test records are not available, base design strength on the following:

Specified Strength F'c - psi	Required Average Strength F'cr - psi
-----	-----
F'c < 3000	F'c + 1000
3000 ≤ F'c ≤ 5000	F'c + 1200

E. Documentation of Average Strength: provide evidence of average strength for each class of concrete in accordance with ACI 301 by field strength tests, strength test records or trial mixtures.

F. Concrete Mix Designs: submit mix designs for each class of concrete.

1. Indicate the following for each mix design:
 - a. Class designation
 - b. Proportions of cement, supplementary cementitious materials, fine and coarse aggregates, and water
 - c. Water-cement ratio, design strength, slump, and air content
 - d. Type of cement, supplementary cementitious materials and aggregates
 - e. Type and dosage of admixtures
2. Adjust mix designs as required by weather and jobsite conditions to maintain specified strengths throughout course of Work without additional cost to Owner.
3. As strength data becomes available during progress of Work, mix designs may be adjusted in accordance with ACI 301.
4. Provide mix with target slump not to exceed 8 inches with no visible signs of segregation.

2.6 PRODUCTION OF CONCRETE

A. Do not mix concrete for placement until:

1. Mix designs and corresponding strength tests reflect that each proposed mix will develop strengths required
2. Mix designs have been reviewed for compliance.

B. Batching and Mixing:

1. Batch and mix ready-mixed concrete in accordance with ASTM C94.
2. Batch site-mixed concrete with scales accurate to within 0.4 percent of their total capacities. Consistently measure ingredients within 1 percent for concrete and water, 2 percent for aggregates and 3 percent for admixtures during operation of batching

- equipment. Mix site-batched concrete in accordance ACI 301.
- C. Admixtures: Charge air-entraining admixtures and other chemical admixtures into mixer as solutions and accurately measure by means of a mechanical dispenser. Consider solution as part of mixing water.

2.7 SOURCE QUALITY CONTROL

- A. Laboratory Inspection
1. Verify required plant certifications
 2. Inspect batching equipment periodically
 3. Inspect batching and loading of transit-mix trucks at start of each production day.
- B. Materials Testing
1. Sieve analysis of aggregates

PART 3 - EXECUTION

3.1 PREPARATION

- A. Do not begin delivery of concrete materials until formwork, reinforcement, and embedded items are complete, properly positioned and secured in place.
1. Remove snow, ice, debris and excessive water from forms.
 2. Pre-wet soil and sand subgrades and surfaces of precast concrete to receive fresh concrete.
 3. Position and secure anchors, waterstops, screeds, control joint forms.
 4. Remove hardened concrete and foreign materials from inner surfaces of conveying equipment, formwork and reinforcing.
- B. Prepare and have ready in good working condition chutes, tremies, pumps, buggies, vibrators and other equipment necessary for orderly and continuous concrete placement.
- C. Where carton-form void forms are used, inspect condition before placing concrete. Replace crushed or weakened boxes and tape joints.
- D. Inspect and repair vapor barrier where applicable.

3.2 INSTALLATION

- A. Conveying:
1. Prevent separation, segregation and loss of ingredients.
 2. Convey concrete from mixer to place of final deposit as rapidly as possible.
 3. Take special precautions with belt conveyors to prevent segregation of ingredients, drying and rise in temperature during conveying.
 4. Use pumps or pneumatic equipment with adequate pumping capacity. Do not exceed 2 inches of slump loss due to pumping. Do not convey concrete through pipes made of aluminum or aluminum alloy.
 5. Thoroughly clean conveying equipment at end of each placement sequence.
- B. Depositing:
1. Place concrete continuously in horizontal layers not more than 12 inches deep. Exercise care to avoid seams or weakened planes within concrete. Deposit concrete into, not away from, previously deposited concrete.
 2. Do not place fresh concrete against concrete that would result in cold joints.
 3. Do not place concrete which has partially set or that contains foreign material.
 4. Avoid splashing forms and reinforcing with concrete.
 5. Place concrete in forms as near as practicable to final position. Do not transport concrete in forms with vibrators or screeds.
 6. Do not drop concrete directly into standing water. Use a tremie with outlet near bottom of place of deposit.
 7. Use tremies, chutes or hoppers to place concrete where a vertical drop greater than 5 feet is required.
 8. Do not place concrete when slump tests indicate plasticity greater than required limits.
 9. Continuously monitor condition of void box forms during placement of concrete. Avoid

- piling concrete on void forms. Replace void boxes that partially or wholly collapse under weight of concrete.
10. Indiscriminate addition of water to increase slump is prohibited. When concrete arrives at jobsite with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded.
- C. Consolidating:
1. Conform to ACI 309
 2. As soon as concrete is deposited, thoroughly agitate by means of mechanical vibrators and suitable hand tools, to work mixture well into parts and corners of forms, and entirely around reinforcement and inserts.
 3. Use mechanical vibrators with minimum frequency of 7000 revolutions per minute.
 4. Do not over-vibrate concrete or use vibrators to transport concrete within forms. Insert vibrators vertically at frequent intervals, do not drag vibrators through concrete.
 5. Do not insert vibrators into lower courses that have begun to set.
 6. Maintain spare vibrators on job site during concrete placing operations.
- D. Placement against hardened concrete:
1. Remove laitance and thoroughly clean and dampen surface of hardened concrete before placement of fresh concrete.
 2. If bond is required, roughen surface in an acceptable manner that exposes coarse aggregate and does not leave laitance, loose aggregate particles, or damaged concrete at surface.

3.3 APPLICATION

- A. Construction Joints
1. Each unit of structure to be monolithic in construction except where specifically required to be otherwise.
 2. Where required, locate construction joints within middle third of span of conventionally reinforced beams and slabs.
 3. Locate construction joints only where shown in structural Contract Documents or approved submittals.
- B. Weather Conditions:
1. Cold Weather:
 - a. Conform to ACI 306, when average of highest and lowest ambient temperature in a 24-hour period is expected to be less than 40 degrees Fahrenheit for more than 3 successive days.
 - b. Concrete mixture temperature can be adjusted by adding uniformly heated water and/or aggregates that conform to ACI requirements.
 - c. Maintain temperature of deposited concrete between 50 degrees Fahrenheit and 70 degrees Fahrenheit for a minimum of 7 days after placement.
 - d. Clear surfaces to receive concrete and spaces to be filled with concrete of snow, ice, and standing water before placement.
 - e. Discuss cold weather concreting methods with Architect prior to concrete placement.
 2. Hot Weather:
 - a. Conform to ACI 305, when ambient temperature is 80 degrees Fahrenheit or higher.
 - b. Maximum allowable fresh concrete temperature is 95 degrees Fahrenheit, unless testing of concrete mixture at higher temperature has been submitted and approved by Architect.
 - c. Concrete mixture temperature can be adjusted by adding chilled water, substituting portions of mixing water with chipped or shaved ice, or other methods that conform to ACI requirements.
 - d. Control concrete surface bleed-water evaporation with application of evaporation reducers, plastic sheeting, fog spray, or wind breaks.
 - e. Discuss hot weather concreting methods with Architect prior to concrete placement.
- C. Slab Thickness
1. Allowable deviation from cross sectional dimensions

- a. Slabs on grade:
 - 1) Average of samples: minus 3/8 inch
 - 2) Individual sample: minus 1/2 inch
- D. Slab Flatness and Levelness:
 - 1. Definitions:
 - a. F_F - maximum variation in floor elevation within any 2-foot length; "flatness"
 - b. F_L - maximum variation in floor elevation between any 2 points separated by 10 feet; "levelness"
 - c. Specified Overall Value - minimum average for Project
 - d. Minimum Local Value - minimum within each column bay
 - 2. Slab flatness and levelness measurements:
 - a. Measure where requested by Owner or Architect, at Owner's expense.
 - b. Measure in accordance with ASTM E1155 and ACI 117.
 - c. Required minimum flatness and levelness values:
 - 1) Typical Slab
 - a) Slab on Grade
 - I) Specified Overall Value – $F_F 25 / F_L 20$
 - II) Minimum Local Value – $F_F 17 / F_L 15$

3.4 FINISHING EXPOSED CONCRETE SURFACES

- A. General
 - 1. Conform to ACI 302.1.
 - 2. Double screed slabs at required elevations.
 - 3. Provide camber as required.
 - 4. Apply finishing products and cure in accordance with manufacturers' recommendations.
- B. Slab Surfaces
 - 1. Scratch Finish
 - a. Locations
 - 1) Surfaces receiving topping slabs
 - 2) Final finish where topping slabs, waterproofing membrane or roofing is placed over finished surface.
 - b. Method: Place, consolidate, strike off, and level concrete. Cut high spots and fill low spots. Roughen surface with stiff brushes or rakes before concrete becomes too stiff to brush or rake.
 - 2. Float finish
 - a. Locations -Walks, steps, and surfaces receiving waterproofing, roofing, insulation, or sand-bed terrazzo.
 - b. Method – Place, consolidate, strike off, and level concrete. Cut high spots and fill low spots. Do not perform further finishing operations until concrete is ready for floating. Floating with hand float, bladed power float equipped with float shoes, or powered disk float. Begin floating when bleed water sheen has disappeared and surface has stiffened sufficiently to permit operation of selected float apparatus. Unless otherwise specified, produce finish that will meet tolerance requirements of ACI 117 for conventional surfaces.
 - 3. Trowel Finish
 - a. Locations – Interior floors.
 - b. Method: Float then trowel concrete surface. Unless otherwise specified, conform to tolerances for a flat surface in accordance with ACI 117. Addition of water to surface to facilitate finishing is prohibited. Do not apply hard-troweled finish to concrete with total air content greater than 3 percent.
 - 4. Broom or belt finish:
 - a. Locations: For parking slabs and exterior surfaces including slabs, ramps, walkways, and steps.
 - b. Method: After concrete has received float finish, give concrete surface a coarse-scored texture by drawing a broom or burlap belt across surface.

- c. Provide mockup of concrete finish for Architect and Owner approval.
- 5. Dry-shake finish
 - a. Locations: Where specified.
 - b. Method: If specified, blend metallic or mineral aggregate with Portland cement in proportions recommended by aggregate manufacturer. Ensure finishing operations do not seal surface before end of bleeding to minimize potential of delamination or blistering. Float-finish concrete surface. Make initial application of dry material by mechanical spreader or by broadcasting with shovels. Begin final floating after final dry-shake application. Following floating, provide hard-troweled finish. Alternatively, if specified in Contract Documents, use bagged, premixed material applied in accordance with manufacturers recommendations.
 - c. Provide mockup of concrete finish for Architect and Owner approval.
- 6. Nonslip finish
 - a. Locations: Interior pan type stair treads and platforms, exterior concrete stair treads, ramps, and where specified in Contract Documents.
 - b. Method: Broom or belt finish, or dry-shake finish
 - 1) For dry-shake finish, give surface a dry-shake application of crushed aluminum oxide, at a rate of at least 25 pounds per 100 square feet, unless otherwise specified.
 - c. Provide mockup of concrete finish for Architect and Owner approval.
- C. Saw-Cutting Concrete (Slabs-on-Grade Only)
 - 1. Saw joints as soon as possible after finishing, but only after concrete is hard enough. Concrete is hard enough when saw blade does not dislodge aggregate and when edges of sawcut do not ravel.
 - 2. Provide joints a minimum of 1/4 inch wide and 1/4 of slab thickness deep unless noted otherwise in Contract Documents.
 - 3. Formed strips may be used in lieu of saw-cutting in same locations and to equal depth as sawn joints.
- D. Formed Surfaces
 - 1. General: Solidly fill holes resulting from removal of bolts or tie rods with cement grout. Fill holes passing entirely through concrete members from inside face with a plunger-type grease gun or other device to force grout through to outside face.
 - 2. Rough Form Finish
 - a. Locations: For surfaces not exposed to view.
 - b. Remove fins exceeding 1/4 inch in height, and grind bulges that interfere with other trades.
 - c. Fill holes and honeycombs.
 - 3. Smooth Form Finish
 - a. Locations: For surfaces exposed to view.
 - b. Remove fins, bulges and unsightly form marks.
 - c. Fill holes and honeycombs to match surrounding concrete surfaces.
 - d. Provide rubbed finish where satisfactory form finish cannot be achieved.
 - 4. Rubbed Finish
 - a. Locations: For surfaces exposed to view.
 - b. Apply finish as soon as possible after casting concrete, no later than one day following form removal.
 - c. Wet surface and rub with carborundum brick or other abrasive to produce uniform color and texture.
 - d. Patch and dress form tie holes and honeycombs to match color and texture of surrounding concrete.
 - 5. Grout Cleaned Finish
 - a. Locations: For surfaces exposed to view, where specified.
 - b. Thoroughly clean surfaces to be finished.
 - c. Mix 1 part Portland cement and 1 1/2 parts fine sand with sufficient water to produce grout with consistency of thick paint. Use white cement as necessary to match color

of surrounding concrete. Wet concrete surfaces to prevent absorption of water from grout. Apply grout uniformly, filling holes and air bubbles. Remove excess grout. After initial set, rub surface with burlap. Wet cure for minimum 36 hours after final rubbing.

3.5 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical damage. Conform to ACI 308.
- B. Protect surfaces not in contact with forms from moisture loss with one of the following methods immediately after finishing and continuing for a period of at least 7 days:
 - 1. Ponding or continuous sprinkling
 - 2. Application of absorptive mats or fabric kept continuously wet
 - 3. Application of sand kept continuously wet
 - 4. Continuous application of steam or mist
 - 5. Application of waterproof sheet materials
 - 6. Application of curing compound in conformance with ASTM C309. Apply curing compounds in accordance with manufacturer's recommendations.
 - a. Do not use curing compound on any surface against which additional concrete is to be placed or other material is to be bonded, unless it is proven that compound will not inhibit bonding, or positive measures are taken to completely remove compound from areas to received bonded materials.
- C. Protect surfaces cast against forms from moisture loss by keeping forms wet until removed. After form removal, protect exposed surfaces from moisture loss by one of the methods specified for surfaces not in contact with forms
- D. Continue curing for a period of 7 days for Type I cement, 3 days for Type III cement, or until tests indicate that concrete has attained 70 percent of required strength.

3.6 Waterstop Installation

- A. Bulb Type Waterstop Installation
 - 1. Heat fuse-welded field butt splices using a Teflon coated, thermostatically controlled waterstop welding iron at manufacturer's recommended temperature. Follow waterstop manufacturer recommendations. Do not lap waterstops, use adhesives with waterstops, or use solvents with waterstops.
 - 2. Center waterstop in joint and secure waterstop in correct position using grommets, pre-punched holes, or hog rings spaced at 12 inches on center along length of waterstop and wire tie to adjacent reinforcing steel.
- B. Adhered Waterstop Installation
 - 1. Inspect waterstop for discontinuity and debris contamination prior to concrete placement. Replace unacceptable waterstop with new product.
 - 2. Adhere waterstop to concrete using waterstop manufacturer's recommended adhesive in accordance with manufacturer's recommendations.
 - 3. Allow adhesive to cure for 2 hours (or longer if recommended by manufacturer) prior to placing concrete over waterstop.
 - 4. Apply waterstop on same day as primer adhesive, within recommended time after applying primer adhesive.
 - 5. Splice waterstop by overlapping ends and pressing ends together in a molding action ensuring no separation or air pockets.
 - 6. Remove separation paper from waterstop just prior to subsequent placement of concrete.

3.7 FIELD QUALITY CONTROL

- A. Laboratory Testing and Inspection
 - 1. Concrete Compression Testing: Secure composite samples in accordance with ASTM C172. Take samples for strength tests of each mix design placed each day at the following intervals:
 - a. not less than once daily,

- b. nor less than once for each 150 cubic yards of concrete,
 - c. nor less than once for each 5,000 square feet of surface area for slabs or walls.
 - 2. Mold and cure specimens from each sample in accordance with ASTM C31. Test concrete specimens in accordance with ASTM C39. A single strength test consists of one of the following:
 - a. Four 6 inch by 12 inch cylinders: one cylinder tested at 7 days, two cylinders tested at 28 days, one cylinder held in reserve if needed.
 - b. Five 4 inch by 8 inch cylinders: one cylinder tested at 7 days, three cylinders tested at 28 days, one cylinder held in reserve if needed.
 - 3. Determine slump for each strength test and whenever consistency of concrete appears to vary, in accordance with ASTM C143. Ready mix trucks with Verifi Slump Management System, or approved equal, are permitted.
 - 4. Determine total air content of concrete sample for each strength test.
 - a. Conform to ASTM C231 for normal weight concrete
 - b. Conform to ASTM C138 or C173 for lightweight concrete.
 - 5. Determine concrete temperature by ASTM C1064 for each strength test.
 - 6. Inspection and Monitoring:
 - a. Inspect concrete mixing and loading of transit-mix trucks at plant.
 - b. Water additions during transit permitted in accordance with ASTM C94, with trucks equipped with automated slump and water management systems, such as Verifi Slump Management System.
 - c. Monitor addition of water to concrete at job site and length of time concrete is allowed to remain in truck during pour.
 - d. Certify each delivery ticket indicating class of concrete delivered or poured, amount of water added, time at which cement and aggregate were discharged into truck, and time at which concrete was discharged from truck.
- B. Waterstop Field Quality Control
 - 1. Bulb Type waterstop splices: the following PVC waterstop splicing defects are unacceptable and will be rejected:
 - a. Tensile strength less than 80 percent of parent section
 - b. Misalignment of centerbulb greater than 1/16 inch
 - c. Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness
 - d. Misalignment that reduces waterstop cross section more than 15 percent
 - e. Visible porosity in weld
 - f. Bubbles or inadequate bonding
 - g. Visible signs of splice separation when cooled splice is bent by hand at sharp angle
 - h. Charred or burned material
- C. Contractor's Responsibilities
 - 1. Furnish necessary labor to assist testing agency in obtaining and handling samples at job-site.
 - 2. Advise testing agency 24 hours in advance of operations to allow for assignment of testing personnel and testing.
 - 3. Provide and maintain for use of testing agency adequate facilities for proper curing of concrete test specimens on project site in accordance with ASTM C31.
- D. Evaluation and Acceptance:
 - 1. Strength test is defined as the average of one of the following, made from the same concrete sample tested at 28 days or as determined by Architect:
 - a. Two 6 inch by 12 inch cylinders
 - b. Three 4 inch by 8 inch cylinders
 - 2. Strength level of a given class of concrete will be considered satisfactory if each of the following requirements are met for that class of concrete:
 - a. Average of any three consecutive strength test results equals or exceeds specified strength.
 - b. No strength test result falls below specified strength by more than 500 psi when specified strength is 5,000 psi or less, or by more than 10 percent of specified

- strength when specified strength is greater than 5,000 psi.
3. Concrete strength tests made and tested by testing laboratory are sole criteria of concrete strength unless in-situ tests are made in accordance with Building Code by a qualified independent testing laboratory. Concrete for which strength tests do not meet criteria for acceptance is considered inadequate until proven otherwise.
 4. Where strength tests fail to meet criteria specified herein, Architect is sole judge of structural adequacy of concrete.
 - a. Contractor responsible for burden of proof of structural adequacy. Strength evaluations conform to requirements of ACI 301.
 - b. If Architect determines, based on strength evaluation testing, that structure is of inadequate strength: repair or remove and replace portions of structure in question, as directed by Architect, at no additional expense to Owner.
 - c. If strength tests fall below specified strength, but not so low as to cause concern for structural adequacy, Architect may request improved conditions of curing or modification of design mixes to improve strength.

3.8 CLEANING AND REPAIR

- A. Upon completion of work, perform the following cleaning and repair procedure:
 1. Remove forms, equipment, protective coverings and resulting rubbish from premises.
 2. Sweep with ordinary broom and remove mortar, concrete droppings, loose dirt, and mud.
 3. Wash concrete floors and platforms with soapsuds and scrub with steel fiber brush.
 4. Mop up suds and flush surfaces with clean water.
 - a. Provide adequate measures during scrubbing, mopping, and flushing operations to keep excessive or injurious amounts of water off floors.
 5. Promptly, effectively and satisfactorily repair any damage occasioned to such floors by or on account of such operations.
 6. Leave finished concrete surfaces in clean condition.
- B. Remove concrete not required by Contract Documents caused by overpour, bulging or collapse of forms or error in form construction.

END OF SECTION

SECTION 04 2200

CONCRETE UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Concrete Unit Masonry as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C90 Standard Specification for Load Bearing Concrete Masonry Units.
 - 2. ASTM C91 Standard Specification for Masonry Cement.
 - 3. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
 - 4. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.
 - 5. ASTM C270 Standard Specification for Mortar for Unit Masonry.
 - 6. ASTM C476 Standard Specification for Grout for Masonry.
 - 7. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - 8. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.
 - 9. ASTM C1329 Standard Specification for Mortar Cement.
 - 10. ASTM C1019 Standard Test Method for Sampling and Testing Grout.
 - 11. ASTM C1384 Standard Specification for Admixtures for Masonry Mortars.
 - 12. ASTM E514 Standard Test Method for Water Penetration and Leakage Through Masonry.
- B. International Masonry Industry All-Weather Council (IMIAC):
 - 1. Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
 - 2. Recommended Practices and Guide Specification for Hot Weather Masonry Construction.
- C. National Concrete Masonry Association (NCMA):
 - 1. NCMA TEK Bulletin #8-2A Removal of Stains from Concrete Masonry.
 - 2. NCMA TEK Bulletin #8-3A Control and Removal of Efflorescence.
 - 3. NCMA TEK Bulletin #3-1C All-Weather Concrete Masonry Construction

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Masonry materials and workmanship shall meet requirements of building codes that are applicable to jurisdiction in which Project is located.
- B. Certifications: Concrete unit masonry supplier shall be a member of NCMA.
- C. Mock-Ups: Prior to start of work, construct a sample panel from approved materials, containing each different kind or color of concrete unit masonry, approximately 4 feet high x 6 feet long (or as required to illustrate wall design) under direction of Architect. Sample wall shall provide a standard of workmanship, bond, thickness and tooling of joints. Construct successive sample panels until standard is approved. When accepted, sample wall shall be standard of comparison for remainder of masonry work. Upon completion of Project, remove sample wall from site and dispose in a legal manner.

1.4 SUBMITTALS

- A. General: Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: For each type of product indicated.
 - 1. Submit complete product data demonstrating compliance with these specifications.
- C. Submit samples to Architect for review prior to constructing job-site mock-ups, delivering materials or commencing work covered in this section.
 - 1. Concrete Masonry Unit samples: Provide two (2) samples of concrete masonry units, to be used on Project showing range of texture and/or color variations of exposed surfaces for units.
 - 2. Mortar Color samples: Provide two (2) samples of mortar "sticks" in specified color.
- D. Mortar and Grout Mix Designs:
 - 1. Submit mix designs and samples to the Architect for review prior to delivering materials to the site or commencing the work in this section in accordance with Section 01 3300, Submittal Procedures.
 - a. Mortar Mix Design: Furnish in accordance with ASTM C270.
 - b. Grout Mix Design: Furnished by either the supplier of grout or an independent testing laboratory.
- E. Cleaning Procedures:
 - 1. Submit proposed cleaning procedures including type of chemical to be used.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. General Requirements for Concrete Masonry Units:
 - 1. All concrete masonry units shall meet ASTM C90 requirements except that when CMU will be exposed in final construction, ASTM C90 "Finish and Appearance" shall be modified to read... "that not more than 3 percent of a shipment contains slight cracks or small chips not larger than 1/2 inch".
 - 2. Units shall be machine made precast concrete units manufactured by a member of N.C.M.A.
 - 3. Units not complying with appropriate ASTM Standards, and as required by this specification shall not be laid in wall where exposed to view and will be rejected and shall be removed and replaced.
 - 4. Provide special block sizes and shapes required or as shown on Drawings.
 - 5. Waterproofing admixture:
 - a. RainBloc (ACM Chemistries)
 - b. MasterPel 240 (BASF)
 - c. Rheopel (Degussa Admixtures, Inc.)
 - d. Dry-Block (Grace Construction Products)
- B. Colored Split Faced CMU:
 - 1. Manufactured from integrally colored masonry. Aggregate shall be volcanic scoria per ASTM C331 and have an average density of three (3) sample units selected at random of not less than 85 p.c.f. nor more than 115 p.c.f. when tested per ASTM C140.

2. Split Faced CMU by Featherlite or approved equal.
 3. Units shall be 8 x 4 x 16 inches or as shown on Drawings with some variation allowed in width and length due to splitting.
 4. Furnish units split on one, two or three faces as required by the design.
 5. Exterior masonry walls shall utilize a "bullnose" design at all outside corner locations subject to human impact and as otherwise indicated.
 6. Colors to match existing Field House.
- C. Burnished Colored Concrete Masonry Units:
1. Manufactured from integrally colored masonry. Aggregate shall be sand conforming to ASTM C331 and have an average density of three (3) sample units selected at random of not less than 85 p.c.f. nor more than 115 p.c.f. when tested per ASTM C140.
 2. Provide Palo Duro Burnished CMU by Featherlite or approved equal.
 3. Variation shall be allowed in width and length due to splitting.
 4. Units shall be 8 x 4 x 16 inches or as shown on Drawings.
 5. Fittings and specialty units shall also be scored as required to fit in with the design scheme.
 6. Exterior masonry walls shall utilize a "bullnose" design at all outside corner locations subject to human impact and as otherwise indicated.
 7. Colors to match existing Field House.
- D. Accessory Units: Provide units as required for windowsills and jambs, doors, control joints, bond beams, lintels, pilaster, caps and other locations as indicated on drawings with a minimum of block cutting.
- E. Mortar:
1. General: Comply with ASTM C270.
 2. Type: "S" below grade (unless noted otherwise on structural drawings) and Type "N" at all above grade locations.
 3. Cement: Type II Portland cement conforming to ASTM C91.
 4. Aggregate: conforming to ASTM C144, except that no less than 3 percent nor more than 10 percent shall pass a No. 100 sieve.
 5. Hydrated Lime: ASTM C207, Type S.
 - a. Color shall match color of masonry unit(s) unless otherwise noted (See General Notes on Drawings) and approved by Architect.
 - b. Color to be factory blended.
 6. Water: Clean and potable.
 7. Waterproofing admixture: As specified above.
- F. Grout:
1. Cement: Type II Portland cement conforming to ASTM C150.
 2. Aggregate: ASTM C404 and as follows:
 - a. Sand: Size No. 1 for fine aggregate.
 - b. Pea Gravel: Size No. 8 for coarse aggregate.
 3. Mix design: minimum compressive strength of 2000 p.s.i. in 28 days, unless higher strength is required by the structural drawings and notes.
 4. Slump: 10 to 11 inches, unless otherwise noted on Drawings.
 5. Use within 1-1/2 hours of initial mixing and use no grout after it has begun to set or after it has become harsh or non-plastic.
 6. Coarse grout may be used in cavity walls with a horizontal dimension of 2 inches or more, and in hollow cell construction 4 inches or more in both horizontal directions.

- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated. Subject to compliance with requirements, provide one of the following:
1. Euclid Chemical Company (The); Accelguard 80.
 2. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 3. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA

2.2 ACCESSORIES

- A. Joint reinforcing: Ladder type, galvanized steel rods with width 2 inches less than wall thickness conforming to UBC Standard 24-15, Part 1.
- B. Dovetail anchor: 16 gauge flat sheet steel, one inch wide, 5-1/2 inch length, designed for use with embedded slot or inserts. Zinc coating shall conform to ASTM A153.
- C. Reinforcing steel: As specified under Section 03 2000, Concrete Reinforcing.
- D. Masonry wall insulation: As specified under Section 04 0500, Masonry Wall Insulation.
- E. Rubber control joints: Rapid Control Joint, regular type as manufactured by Dur-O-Wal or approved equal.
- F. Through wall flashings: Equal to 32 mil. Self-healing rubberized sheet flashing bonded to a 12 mil. polyethylene film as manufactured by "Dur-o-Wal" or equal.
- G. Sheet metal flashings: See Section 07 6200, Sheet Metal Flashing and Trim.
- H. Chemical Cleaner: Cleaner shall be a solution acceptable to the masonry unit manufacturer, for the intended purpose.
- I. Expansion Anchors: Structural Steel for Work except as otherwise indicated or specified shall conform to ASTM A36 for miscellaneous steel items and ASTM A992 (Fy=50KSI) for wide flange sections. Steel pipe shall conform to ASTM A500 (Fy=42KSI), Type E or S, Grade B. Tubular steel shall be ASTM A500.
- J. Weep/Vent Products: Use one of the following unless otherwise indicated:
1. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
 2. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch (9-mm) OD by 4 inches (100 mm) long.
- K. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Subject to compliance with requirements, provide products by one of the following:
1. Advanced Building Products Inc.
 2. CavClear/Archovations, Inc.
 3. Heckmann Building Products, Inc.
 4. Hohmann & Barnard, Inc.
 5. Mortar Net Solutions.
 6. Wire-Bond.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine surfaces and supports to receive Work and report in writing, with a copy to Architect, detrimental conditions. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for correction(s) Architect may require. Commencement of Work will be construed as acceptance of all conditions
 - 1. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.
- B. Coordination with other Work: Coordinate with other work that affects, connects with, or will be concealed by this Work.

3.2 PREPARATION

- A. Protection: Protect sills, ledges, offsets and other projections from dropping of mortar and grout.
- B. Comply with National Concrete Masonry Association (NCMA) recommendations for hot weather or cold weather conditions as they apply to the Work.

3.3 INSTALLATION

- A. General Requirements for Concrete Masonry Walls:
 - 1. Lay units in uniform and true courses, level and plumb to height indicated on drawings.
 - 2. Surface of units shall be clean and free from dirt when laid in walls.
 - 3. Lay concrete unit masonry in such a way that cracks are not formed at time unit is placed in wall.
 - 4. Units shall not be wetted before being used and shall be laid dry.
 - 5. Adjusting Units:
 - a. Units shall be adjusted to be level, plumb and straightened into final position in wall while mortar is still soft and plastic enough to ensure a good bond.
 - b. Avoid over-plumbing and pounding of corners and jambs to fit stretcher units after they are set in position.
 - c. If position of unit is shifted after mortar has stiffened, or bond is broken or cracks are formed, re-lay unit in new mortar.
 - 6. Bearings on Walls: Unless noted otherwise provide 3 courses of solid units or grouted hollow masonry units below steel bearing plates or beams bearing on walls. Extend bearings each side of contact with load as required to properly transfer loads into wall.
 - 7. Openings: Provide openings in masonry walls where required or indicated. Steel lintels shall be provided unless otherwise noted. Where a waterproofing admixture is utilized in the CMU provide through-wall flashings and weeps to direct water to the outside.
 - 8. Masonry parapets without copings/caps: Where no parapet coping or other element is to be constructed or installed to provide a positive slope at the top of the parapet, a mortar (cap) sloped towards the building interior shall be provided.
 - 9. Cutting of Masonry: When required, exposed block units shall be cut with a power driven carborundum or diamond disc blade saw. When using "wet" cutting methods, clean water shall be used on exposed units.

10. Anchor masonry units facing against or abutting concrete members to concrete by use of dovetailed flat bar anchors inserted in slots built into concrete.
 - a. Unless noted otherwise space anchors not more than 16 inches vertically and 24 inches horizontally.
 - b. Maintain a space not less than 1/2 inch width between masonry and concrete members, keeping space free of mortar or other rigid materials so as to permit differential movement.
- B. Bonding:
 1. Bond pattern shall be as indicated on the Drawings. Where no bond pattern is shown, the wall shall be laid up in straight uniform course with regular running bond.
 2. Bond shall be plumb throughout face of wall.
- C. Bearing Wall Intersections:
 1. Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
 2. One wall shall terminate at face of other wall with a control joint at intersection.
 3. Tie intersecting wall together with a metal tie bar, 1/4 inch x 1-1/4 inches x 2 feet 4 inches long with a 2 inch right angle bend at each end of bar, spaced vertically at 2 feet on center.
 4. Bends at ends of tie bars shall be embedded in grouted cells.
 5. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
 6. Provide sealing of control joint as specified.
- D. Non-Bearing Wall Intersections:
 1. Tie non-bearing wall together with strips of metal lath or galvanized 1/4 inch mesh hardware cloth placed across joint between 2 walls placed in alternate horizontal block courses.
 2. Rake out vertical joint between intersecting walls to a depth of 3/4 inch after mortar has stiffened.
 3. Provide sealing of control joint as specified.
- E. Mortar Joints:
 1. Joints shall be straight, clean and a uniform 3/8 inch thickness on exposed wall face and comply with NCMA TEK 19-2.
 2. Exposed vertical and horizontal joints shall be tooled to produce a dense, slightly concave surface that is well bonded to the unit at edges, or as indicated.
 3. Joints shall be struck flush at surface to receive dampproofing, waterproofing, or finishes requiring flush joints that are to be concealed.
 4. Where interior walls are to receive plaster or other finishes, strike joints flush.
 5. Solidly fill joints from face of unit to depth of face shell, except where specified otherwise.
 6. Full bedding to be provided for first course on foundation and wherever maximum strength is required.
 7. Butter vertical head joints well and shove these joints tight so that mortar bonds well to both units.
 8. Full coverage to be provided on bed of face shells and webs surrounding cells to be filled.
 9. Bee-holes or other open joints shall be filled and tooled with mortar while mortar is still fresh.
 10. Installation of mortar shall be in accordance with AMG Standard 108.
 11. Consistency of appearance shall be maintained throughout the project.

- F. Control Joints:
1. Provide control joints, as detailed, at vertical masonry walls where such walls exceed 40 feet in length. In long length of walls, provide joints at approximately 24 feet on center or as detailed.
 2. Control joints shall be continuous full height of walls.
 3. At bond beams, control joints shall separate both block and grout; however, steel reinforcing shall be continuous.
 4. Horizontal wire reinforcing shall not run through control joint.
 5. Control joints shall not occur at wall corners, intersections, ends, within 24 inches of concentrated points of bearing or jambs or over openings unless specifically indicated on Structural Drawings.
 6. Control joint materials shall be held back from finished surface as required to allow for sealant and back-up materials.
- G. Horizontal Joint Reinforcing:
1. Place horizontal joint reinforcing every 16 inches vertically throughout wall construction.
 2. Continuously reinforce first bed joint immediately above and below openings. Provide reinforcing in second bed joint above and below openings that extend 2 feet beyond each side of opening.
 3. Lap reinforcement a minimum of 6 inches at splices.
 4. Cut and bend reinforcing at corners.
- H. Vertical Reinforcing and Bond Beam Reinforcing:
1. Place in accordance with requirements of drawings.
 2. Vertical Reinforcement: Provide continuous reinforcing full height of wall at wall ends, corners, intersections, jambs of openings and each side of control joints. Vertical reinforcing shall match and lap dowels which are at top of foundation walls and precast concrete beams.
 3. Bond Beams: Unless noted otherwise provide horizontal reinforcing of 2 bars in minimum 8 inch deep grouted continuous bond beam at roof and elevated floor lines.
 4. Parapets: Unless noted otherwise provide horizontal reinforcing of 1 bar in minimum 8 inch deep grouted continuous bond beam at top of parapets. Where no parapet coping is to be installed, provide a mortar (cap) sloped towards the building interior.
 5. Bond Beam and Parapet Reinforcing at Vertical Control Joints: Place bars continuous through control joint and wrap mastic tape around bars for 18 inches each side of control joint.
 6. Bond Beam and Parapet Reinforcing at Corners and Wall Intersections: Provide bent bars to match reinforcing at corners and wall intersections.
 7. Lap splices in reinforcing not less than 40 bar diameters for #7 and larger bars; 30 bar diameters for #6 and smaller bars.
 8. Use spacers to position reinforcing steel in center of grout at center of wall as required by code.
- I. Grouting:
1. Reinforcing steel is to be in place and inspected before grouting starts.
 2. Vertical cells to be filled shall have vertical alignment to maintain a continuous cell area.
 3. Keep cell to be grouted free from mortar.
 4. Fill cells solidly with grout in lifts not to exceed those specified or allowed by AHJ.
 5. Grout may be poured by hand bucket, concrete hopper or through a grout pump.
 6. Do not wet down grout space prior to pouring of grout.
 7. Stop pours 1-1/2 inches below top of cell to form a key at pour points.

8. Grout shall be consolidated by mechanical vibration during placing before loss of plasticity in a manner to fill grout space. Grout pours greater than 12 inches shall be reconsolidated by mechanical vibration to minimize voids due to water loss.
9. Grout barrier below bond beams shall be continuous wire lath or other approved material.
10. Grout beams over openings and bond beams in a continuous operation.
11. Solidly grout in place bolts, anchors and other items within wall construction.
12. Fully grout jambs and head of metal door frames connected to masonry. Filling of frames shall be done as each 2 feet of masonry is laid.
13. Use extreme care to prevent grout or mortar from staining face of the masonry.
14. Immediately remove grout that is visible on face of masonry.
15. Installation shall be in accordance with AMG Standard 108.

J. Flashing and Weeps:

1. Provide and install in accordance with NCMA TEK 19-2A, 19-4A and 19-5A.
2. Install continuous flashing at floor lines, above window and door openings, mechanical openings, and all other openings in exterior masonry walls.
3. Install weeps at head joints located to direct moisture from flashing to exterior. Locate as indicated on drawings but no more than 32 inches O.C. with a minimum of (2) weeps at each opening.

K. Provisions for other trades and built-in items:

1. Built-in items required and indicated, including; but not limited to, reinforcing steel, anchors, flashings, sleeves, frames, structural steel, loose lintels, anchor bolts, nailing blocks, door and window frames and miscellaneous iron.
2. Enclosures for pipes, stacks, ducts and conduits:
 - a. Construct slots, chases, cavities, and similar spaces as required.
 - b. Where masonry is to enclose conduit or piping, bring it to proper level indicated and as directed.
 - c. Cover no pipe, conduit chases or enclosures until advised that Work has been inspected and approved.
3. Insulation: Fill ungrouted cells in exterior masonry walls and/or interior masonry walls with masonry wall insulation, as specified in Section 04 0500, Masonry Wall Insulation. Install in strict accordance with the manufacturer's recommendations for the system specified. Coordinate insulation activities with all other affected trades.

3.4 ADJUSTING

A. After installation of masonry insulation, the masonry Subcontractor shall inspect all walls for evidence of voids, bee holes, and other defects and shall repair to match the adjacent surface.

B. Pointing of Mortar Joints:

1. Point and fill holes and cracks in exposed mortar joints.
2. Cut out defective mortar joints to a depth of at least 1/4 inch.
3. When cutting is complete, remove dust and loose material by brushing or vacuuming.
4. Prehydrate mortar for pointing by mixing dry ingredients with only sufficient water to produce a damp mass of such consistency that it will retain its form when it is pressed into a ball with hands but will not flow under trowel.
5. Allow mortar to stand for a period of not less than one hour nor more than 2 hours, after which remix with addition of sufficient water to produce satisfactory workability.
6. Pointing mortars shall be identical to adjacent mortar in similar joints and finish results shall match and be indistinguishable from original mortar used.

7. Premoisten joint and apply mortar tightly.
8. Tool to match adjacent joints.
9. Moist cure for 72 hours.

- C. Patching: If approved by Architect, patching of exposed masonry walls shall be done at conclusion of general work and shall conform as closely as possible to similar surrounding or adjoining work.

3.5 FIELD QUALITY CONTROL

- A. General: Architect will require tests and inspections as necessary to verify quality and strength of grout and mortar. Laboratory tests shall conform to applicable ASTM standards and tests.
- B. Testing Laboratory: Material testing shall be provided in accordance with Section 01 4500, Quality Control.
- C. Frequency: As determined by the Architect based upon total time for construction of masonry with not less than two (2) tests per each level of masonry construction, foundation to roof or floors.
- D. Mortar:
1. Testing per ASTM C780.
 2. For determining hardened mortar properties, prepare three (3) test specimens for each test age and property. A strength test shall be the average of the strengths of the specimens tested at the age specified.
 3. Specimens shall be tested at 7 and 28 days.
 4. In case of dispute, the mortar proportions must be tested in accordance with the property specification of ASTM C270.
- E. Grout:
1. Testing per ASTM C1019.
 2. Three test specimens shall constitute one sample. A strength test shall be the average of the strengths of the specimen tested at the age specified.
 3. Specimens shall be tested at 7 and 28 days.
 4. The compression strength will be considered satisfactory if the average of three consecutive tests of the grout is equal to or greater than the specified strength and no individual strength test falls below the specified strength by more than 500 p.s.i.
- F. Test reports: The Testing Laboratory shall distribute copies of reports as specified in Section 01 4500, Quality Control.

3.6 CLEANING AND PROTECTION

- A. Mortar and grout spills will be cleaned immediately from surfaces that will be exposed to view.
- B. Chemical cleaner application to be in strict accordance with manufacturer's printed instructions and NCMA TEK Bulletins.
- C. Furnish temporary protection for exposed masonry corners subject to damage.
- D. Carefully cover tops of walls left incomplete at conclusion of day's work with tarpaulins or other approved covering.

- E. In hot and dry weather, protect masonry against rapid drying in compliance with recommendations of NCMA TEK Bulletin 3-1 and IMIAC.
 - 1. Fog spray new masonry 3 times/day for 3 days when mean daily temperature exceeds 100 degrees F or 90 degrees F with wind velocity greater than 8 mph.
- F. In cold weather, protect masonry against freezing in compliance with recommendations of NCMA TEK Bulletin 3-1 and IMIAC.
 - 1. Protect finished work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.
- G. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 05 1200

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel columns
 - 2. Steel beams
 - 3. Fusion welded anchors
 - 4. Miscellaneous angles and plates
 - 5. Bolts
 - 6. Steel assemblies to be embedded in concrete
 - 7. Laboratory testing and inspection
 - 8. Shop painting
 - 9. Supplementary parts and members necessary to complete and erect structural steel frame

1.2 REFERENCE STANDARDS (Latest Edition)

- A. American Institute of Steel Construction, AISC:
 - 1. AISC Manual of Steel Construction.
 - 2. Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
 - 3. Code of Standard Practice for Steel Buildings and Bridges.
 - 4. Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- B. American Society for Testing and Materials:
 - 1. ASTM A36, Standard Specification for Structural Steel.
 - 2. ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A108, Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
 - 4. ASTM A123, Standard Specification for Zinc (Hot- Galvanizing) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, bars and strip.
 - 5. ASTM A143, Recommended Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - 6. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 7. ASTM A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - 8. ASTM A307, Standard Specification for Carbon Steel Externally Threaded Standard Fasteners.
 - 9. ASTM A325, Standard Specification for High-Strength Bolts for Structural Steel Joints.
 - 10. ASTM A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 11. ASTM A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 12. ASTM A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.
 - 13. ASTM A786, Standard Specification for Hot-Rolled Carbon, Low Alloy, High Strength Low Alloy, and Alloy Steel Floor Plates
 - 14. ASTM A992, Standard Specification for Steel for Structural Shapes for Use in Building Framing.
 - 15. ASTM F1554, Standard Specification for Anchor Bolts
 - 16. ASTM B117, Standard Salt Spray (Fog) Testing.
 - 17. ASTM D522, Standard Test for Elongation of Attached Organic Coatings with Conical Mandrel Apparatus.
- C. American Welding Society:

1. AWS D1.1, Structural Welding Code - Steel.
2. AWS D1.3, Structural Welding Code - Sheet Steel.
- D. Industrial Fasteners Institute:
 1. Handbook on Bolt, Nut and Rivet Standards.
- E. American National Standards Institute:
 1. ANSI B18.2, Fasteners.
 2. ANSI B27.2, Plain Washers.
- F. The Society for Protective Coatings, SSPC:
 1. SSPC Painting Manual, Volume 1, Good Painting Practice.
 2. SSPC Painting Manual, Volume 2, Systems and Specifications.

1.3 SUBMITTALS

- A. Shop Drawings: Submit detailed shop and installation drawings showing shop and erection details including member sizes, grades of materials, details of fabrication and erection, and end connections.
 1. Do not begin fabrication of materials prior to review of shop drawings.
 2. Review of shop drawings is for member sizes, spacings, detail, and general compliance with Contract Documents only.
 3. Material quantities, lengths, fit, verification of job conditions and coordination with other trades are responsibility of Contractor.
 4. Reproductions of Contract Drawings shall not be used for shop drawings.
- B. Erection Procedure: Submit descriptive data illustrating general procedure for erection of structural steel including sequence of work, proposed schedule and details of temporary staying and bracing.

1.4 QUALIFICATIONS

- A. Arc-Welding: Welding procedures and techniques, welders and tackers shall be qualified in accordance with AWS D1.1.
 1. Welders to be employed on Work shall maintain current AWS certification throughout duration of Project.
 2. If requested by Architect, submit identifying stenciled test coupons made by operator whose workmanship is subject to question, and if reasonable doubt of proficiency exists, welder shall be re-qualified and certified by independent testing laboratory at no additional expense to Owner.
 3. Work suspected of deficient quality may be subject to removal of coupons from any location on any joint for testing. Remove sections of welds found defective and properly rewelded before proceeding with work.
- B. Steel Fabricator: not less than 5 years of experience in fabrication of structural steel.
- C. Steel Erector: not less than 5 years of experience in erection of structural steel.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of anchor bolts and other anchorage assemblies to be embedded in concrete or masonry construction. Provide setting drawings, instructions and templates required for proper placement of anchor bolts and embeds.
- B. Sequence shipments of fabricated steel to expedite erection and minimize field handling of material.
- C. Store structural steel above ground on skids or platforms, and protect from corrosion. Store packaged materials in unbroken containers.
- D. Do not bend or damage materials during shipment, handling and erection.
- E. Take precautions in the removal of packaging or bundling devices to prevent damage to materials.
- F. Certification numbers for fasteners shall appear on product containers and shall correspond to identification numbers on mill test reports.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Structural Steel, normal grade: ASTM A36.
- B. High Strength Structural Steel: ASTM A572 - Grade 50.
- C. High Strength Structural Steel (W-Sections): ASTM A992 – Grade 50.
- D. Steel Pipes: ASTM A53 - Grade B (35,000 psi yield).
- E. Hollow Structural Sections (HSS) – Round or Rectangular: ASTM A500 - Grade B.
- F. Erection Bolts: ASTM A307, ANSI B18.2.1, and ANSI B18.2.2.
- G. High Strength Bolts: ASTM A325N, ANSI B18.2.1, ANSI B18.2.2.
 - 1. Manufacturer's symbol and grade markings shall appear on bolts and nuts.
- H. Anchor Bolts: ASTM F1554 Grade 36
- I. Washers: ANSI B27.2 Type A.
- J. Welding Electrodes:
 - 1. Welding electrodes shall conform to AISC Specifications. Use E70 electrodes for ASTM A36 and ASTM A572 Grade 50 Steel.
 - 2. Coatings of low-hydrogen electrodes shall be thoroughly dry when used. Electrodes taken from hermetically sealed packages shall be used within 4 hours, or shall be dried in accordance with AWS D1.1 before use.
 - 3. Do not use electrodes of any type that have been wet.
- K. Coatings for structural steel
 - 1. Shop Primer:
 - a. Rust-inhibiting primer
 - b. Paint and methods of paint application shall comply with applicable air-quality and environmental regulations.
 - c. Paint shall be compatible with welding procedures and shall produce no significant difference in strength of weld material.
 - d. Paint shall meet or exceed requirements for abrasion - Fed. Test No. 141; elongation - ASTM D522; and salt spray - ASTM B117.
 - 2. Zinc-Coating: Where galvanizing steel is required, zinc coating shall conform to ASTM A123 and A143. Zinc coating for threaded products shall conform to ASTM A153. Do not galvanize ASTM A490 bolts.
 - 3. Cold Galvanizing: Galviline as manufactured by ZRC WORLDWIDE, Marshfield, MA (phone 800.831.3275; web site www.zrcworldwide.com), and used for repair only.
- L. Shear Studs
 - 1. Headed fusion welded shear connectors with proper ferrules and accessories especially designed to create composite deck action by mating of shear connectors, concrete deck, and supporting beam.
 - 2. Steel shall conform to ASTM A108 grades C1010-1020, minimum tensile strength of 60,000 psi.
 - 3. Studs shall be of uniform diameter, heads concentric and normal to shaft, and weld end chamfered and solid flux.

2.2 DESIGN OF CONNECTIONS

- A. Design connections to resist required forces, where not detailed on Drawings.
- B. Design connections for simple beams (except where end reactions are otherwise scheduled) for 55 percent of total uniform load capacity shown in Maximum Total Uniform Load Tables, Part 3, of AISC Manual, for given beam, span and grade of steel specified.
- C. Note slip critical connection requirements clearly on shop drawings.
- D. Complete penetration butt weld moment connections to develop 100% of flexural capacity of member.
- E. Detail bolted connections using bolts conforming to ASTM A325N, Bearing Type Connections with threads allowed in shear plane. Details shall be in accordance with AISC Specification for Structural Joints.
- F. Diagonal Bracing: Where forces are indicated on the drawings, design connections for 1.15 times the indicated force. Where forces are not indicated, design connections for full strength of member in tension.
- G. Do not use welds in combination with bolts in the same face of any connection.

2.3 FABRICATION

- A. Fabricate materials in accordance with applicable AISC Specifications and Standards.
- B. Pre-assemble work as much as possible and deliver to site ready for erection. Mark and match-mark pieces where field assembly is required.
- C. Prior to fabrication; straighten materials, remove twists and bends and clean faying surfaces of scale and rust.
- D. Clean members to be painted with power tools in accordance with SSPC standards.
- E. Camber beams to within 1/8th inch per 15 feet of beam length. Mark beams indicating direction of fabricated or natural camber.
- F. Provide members of required sizes, weights, shapes and lengths. Do not splice members to achieve required lengths except where specifically allowed by the Architect. Do not alter member shapes or lengths or enlarge bolt holes in the field for proper fit; return materials to the fabrication shop for correction where required. Member splices allowed for the convenience of the fabricator or erector shall not result in additional cost to the Owner.
- G. Punch or drill holes for bolts. Hole sizes shall conform to AISC Specifications.
- H. Compression joints shall have both contact surfaces milled for precision fit. Other joints shall be cut or dressed straight and true and prepared as required for welding. Components of assemblies and built-up members shall be pinned and rigidly maintained in accurate position during final assembly.

2.4 WELDED CONSTRUCTION

- A. Comply with AWS D1.1.
- B. Clean surfaces of loose scale, rust, paint, grease and dirt. Remove oil with benzine. Wire brush welds after depositing for visual inspection. Welds shall be smooth and uniform in cross section, shall be free of porosity and clinkers, and shall have required fusion and penetration into base metal.
- C. Secure members in proper position for welding.
- D. Take proper precautions to minimize residual stresses and distortions in members being welded.
- E. Preheat and interpass temperatures shall conform to Table 3.2, AWS D1.1.
- F. Prepare members to be butt-welded in accordance with AISC recommendations for pre-qualified welds, and provide required clearances and back-up bars. Remove back-up bars after completing welds.
- G. Lay fillet welds of required sizes in proper position and with gaps not exceeding AISC recommendations.
- H. Tack welding shall not affect quality of finished welds.

2.5 BOLTED CONSTRUCTION

- A. Provide holes at right angles to members of sizes recommended by AISC Specifications. Short-slotted holes shall not be used for primary frame connections (members connecting to columns), trusses and wind bracing unless specifically allowed by the Architect. Where used, short-slotted holes shall be oriented normal to the direction of load.
- B. Provide beveled washers for surfaces out of parallel more than 1:20.
- C. Provide bolts of sufficient length to extend entirely through nuts.
- D. Protect fasteners from dirt and moisture at job site. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protective storage. Fasteners not used shall be returned to protected storage at end of shift. Fasteners shall not be cleaned of lubricant that is present in as-delivered condition. Fasteners for slip critical connections which must be cleaned of accumulated rust or dirt resulting from job site conditions, shall be cleaned and relubricated prior to installation.
- E. Anchor bolts and erection bolts: tighten with a suitable wrench not less than 15 inches long. Tap bolt heads with a hammer while tightening.
- F. High Strength Bolts: install bolts in properly aligned holes, and tighten to snug tight condition. Snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact.
- G. Hand tighten and tack weld (nut-to-bolt shank) bolts required to be "finger-tight".

- H. Holes for anchor bolts in base plates may be oversized in accordance with AISC Specifications. Provide washers as indicated on Drawings.

2.6 COATINGS

A. SHOP PAINTING

1. Apply one coat of rust-inhibitive primer to surfaces of structural steel members except: surfaces required to be field welded, to be encased in concrete, to be spray fireproofed, and top flanges of beams with shear connectors to support metal deck.
2. Thoroughly clean surfaces to be painted of all loose mill scale, dirt, rust, and other foreign matter with steel scrapers, wire brushes, or sandblasting in accordance with SSPC SP-3.
3. Mix paint in accordance with manufacturer's recommendations, continuously stir during application, and do not add thinner after initial mixing.
4. Apply paint in accordance with manufacturer's recommendations, thoroughly work over surfaces and into corners. Minimum dry thickness of coating shall be 2 mils.
5. Repair damage to coating prior to delivery.

B. GALVANIZING

1. Galvanize steel members as noted on Drawings.

2.7 SOURCE QUALITY CONTROL

A. Inspection of Structural Steel:

1. Provide access to materials in fabrication and full cooperation to testing laboratory.
2. Following testing services shall be performed:
 - a. Inspect fabrications in shop.
 - b. Check temporary bracing of steel frame.
 - c. Check location and condition of anchor bolts.
 - d. Check plumbness and tolerance of steel frame.
 - e. Qualification of welders and welding techniques.
 - f. Visually inspect erection bolts.
 - g. Inspection of high-strength bolting:
 - 1) In accordance with Section 9 of AISC Specifications for Structural Joints.
 - 2) Confirm that fasteners meet project specification and are properly stored and handled.
 - 3) Confirm that faying surfaces have been properly prepared before connections are assembled.
 - h. Visually inspect all field and shop welds.
 - i. Complete-penetration welds.
 - 1) Ultrasonic or X-ray testing per AWS Standards.
 - 2) Testing shall be performed on 100% of shop and field complete-penetration welds.
 - j. Re-inspect corrective measures required at expense of Contractor.

- B. Remove and replace Connections found to be faulty at no additional cost to the contract.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify condition and position of anchor bolts and embeds in concrete prior to commencing erection.
- B. Correct misaligned or missing components required for connections to steel framework before commencing erection.
- C. Measure camber of erected steel beams and report deviations from required camber before placing concrete slabs. Do not place concrete on beams that have inadequate or negative camber.

3.2 ERECTION AND FIELD ASSEMBLY

- A. Erect structural steel in accordance with AISC Specifications. Work shall be plumb, square, true to line, level and in proper position and orientation.

- B. Provide temporary bracing and guys to maintain stability of framework during erection for stresses and loads due to erection equipment and its operation, weight of structure, wind, and temporary loads imposed during erection. Check and adjust bracing frequently during progress of erection and assembly. Maintain temporary bracing until all components of the structure required for lateral stability are in place and final connections made.
- C. Do not stack materials on partially completed framework, or in a manner to cause damage or overloading of the structure.
- D. Tolerances shall be in accordance with AISC Code of Standard Practice and as follows:
 - 1. Individual members plumb or level to within 1:750.
 - 2. Vertical dimensions: 1/4 inch per story, exclusive of elastic shortening of columns.
 - 3. Horizontal dimensions: +/- 1:2000 for overall length or width.
- E. Field Assembly:
 - 1. Assemble steel framework accurately to lines and elevations indicated and within specified tolerances. Align and adjust members forming parts of a completed frame before fastening.
 - 2. Erect structural steel in proper sequence with work of other trades.
 - 3. Tie anchor bolts securely in position before concrete is placed.
 - 4. Thoroughly clean bearing surfaces and surfaces to be in permanent contact before assembly.
 - 5. Adjust bolt holes requiring enlargement only by reaming, not by drifting or burning.
 - 6. Erection bolts may be tightened and left in place.
 - 7. Straighten and correct members damaged during handling or replace without additional cost to the Owner.
- F. Field Connections:
 - 1. After frame is aligned and plumb, make final welded and bolted connections in accordance with AISC Specifications.
 - 2. Properly sequence welding to prevent distortion, and misalignment of the framework.
 - 3. Maintain temporary bracing of the structure until connections are complete and other required components of the structure (e.g. floor slabs and metal roof decks) are in place.

3.3 ADJUSTING

- A. Touch-up field welds, abrasions and scarred areas of structural steel with same paint used for shop coating after erection of frame and final connections are completed.

3.4 FIELD PAINTING

- A. Refer to Section 09 9000 for field painting of exposed steel.

END OF SECTION

SECTION 05 3123

METAL ROOF DECK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal Roof Deck
 - 2. Sheet Metal Accessories

1.2 REFERENCES (Latest Edition Available)

- A. Steel Deck Institute (SDI), Specifications and Commentary for Steel Roof Deck.
- B. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members.
- C. American Welding Society:
 - 1. AWS A5.1, Specification for Steel, Carbon, Covered Arc Welding Electrodes.
 - 2. AWS D1.3, Structural Welding Code - Sheet Steel.
- D. American Society for Testing and Materials:
 - 1. ASTM A90, Standard Tests for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
 - 2. ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3. ASTM A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - 4. ASTM A1008, Standard Specification for Steel Sheet, Cold-Rolled Sheet, Carbon, Structural.
 - 5. ASTM B117, Standard Salt Spray (Fog) Test.
 - 6. ASTM D714, Evaluating Degree of Blistering of Paints.
 - 7. ASTM D1654, Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- E. Underwriters Laboratories, Inc.:
 - 1. Bulletin of Research No. 52, Development of Apparatus and Test Method for Determining Wind Uplift Resistance of Roof Assemblies.
 - 2. Standard UL580, Tests for Wind Uplift Resistance of Roof Assemblies.

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for review prior to fabrication or installation of materials.
 - 1. Indicate erection layouts, details, steel deck dimensions and section properties, and installation instructions. Show supporting framing, lengths and markings of deck to correspond with sequence and procedure to be followed in installing and fastening deck. Show methods of fastening deck and installing accessories. Show locations, types and sequence of welded connections for deck units.
 - 2. Indicate welds using standard AWS welding symbols. Show size and number of holes to be cut in deck.
 - 3. Indicate allowable diaphragm shear capacity corresponding to pattern and type of connections provided.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications
 - 1. Member Steel Deck Institute.
 - 2. Minimum 5 years of experience.
- B. Erector Qualifications
 - 1. Minimum 5 years of experience.

2. Welders certified within previous 6 months.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver deck in bundles and store on pallets above the ground, protect from corrosion and damage. Rusty, crimped or bent deck shall not be installed in the work.
- B. Do not store materials on installed deck before connecting to supporting structure.
- C. Do not overload deck during construction by workmen or storage of materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Grades:
 1. ASTM A1008, Grade C for painted deck.
- B. Miscellaneous steel plates at vents, sump pans, and closures: 20 gage material.
- C. Welding Rods: AWS A5.1, E70
- D. Weld Washers: 14 gage, with 3/8ths diameter hole at center.
- E. Galvanizing:
 1. Wiped zinc coating, 0.2 to 0.5 ounces per square foot, complying with ASTM A924.
 2. Comply with ASTM A90 and A239 for weight and uniformity.

2.2 MANUFACTURED UNITS

- A. Metal deck units shall comply with the Specifications of the Steel Deck Institute.
- B. Design units for required spans and conditions of continuity, generally for 3 continuous spans, except as required by layout.
- C. Stresses under construction loads, gravity loads and wind loading shall not exceed recommendations of the Steel Deck Institute.

2.3 FABRICATION

- A. Fabricate in lengths as long as practical and piece-mark bundles for identification during erection.
- B. Painting:
 1. Thoroughly clean deck and coat both sides with phosphate prior to painting.
 2. Apply paint .30 mils minimum thickness to both sides of deck and heat cure for tough, abrasion-resistant finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not lay deck units in place until supporting structure is secured in place and final connections are complete.
- B. Layout deck units in accordance with shop drawings, do not stretch or bend units.
- C. Overlap ends a minimum of 2 inches. Interlock side laps as shown on shop drawings.
- D. Connections:
 1. Anchor deck to supporting steel with full-fusion puddle welds. Use weld washers where required.
 2. Connect per drawings.
- E. Weld metal fillers and closure pieces in place.

3.2 FIELD QUALITY CONTROL

- A. Laboratory Testing and Inspection:
 1. Inspect condition of deck units for damage and corrosion.
 2. Inspect connections of deck to structure and at side laps.

3.3 ADJUSTING

- A. Touch-up scarred areas on both sides of deck including welds, rust spots and abrasions by wire-brushing and painting with shop paint.

- B. Repair blow-holes at welds with 18 gage plates welded in place. Replace entire sections of deck where holes cannot be satisfactorily repaired.

3.4 HANGERS FOR MISCELLANEOUS EQUIPMENT

- A. Do not attach hangers for ceilings, ductwork, or piping directly to metal roof deck.

END OF SECTION

SECTION 05 5200

PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of steel Pipe and Tube Railings.

1.2 REFERENCES

- A. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- B. ASTM A 153/A 153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- C. ASTM C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout
- D. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- E. ASTM A36/A36M – Standard Specification for Carbon Structural Steel
- F. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- G. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

1.3 PERFORMANCE REQUIREMENTS

- A. General: Design handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
 - 1. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary".
 - 2. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members".
- B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding structural loads required by applicable building code without exceeding allowable design working stresses of materials for handrails, railings, anchors and connections.
- C. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design and extent.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.5 COORDINATION

- A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.6 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevation, sections, component details and attachments to other work.
 - 1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 PRODUCTS

2.1 METALS

- A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations and other imperfections where exposed to view on finished units.
- B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
 - 1. Steel Pipe: ASTM A53 or ASTM A 500; finish, type, and weight class as follows:
 - a. Black finish, unless otherwise indicated.
 - b. Galvanized finish for exterior installations and where indicated.
 - c. Type F or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 2. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.
 - 3. Steel Plates, Shapes and Bars: ASTM A 36/A 36M.
- C. Brackets, Flanges and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 WELDING MATERIALS, FASTENERS AND ANCHORS

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength and compatibility in fabricated items.
- B. Fasteners for Anchoring handrails and Railings to Other Construction: Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
 - 1. For steel handrails, railings and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

2.3 GROUT AND ANCHORING CEMENT

- A. Non-shrink, nonmetallic grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Erosion-resistant anchoring cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to corrosion from water exposure without needing protection by a sealer or waterproof coating that is recommended by manufacturer for exterior use.

2.4 FABRICATION

- A. Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing details, finish and anchorage, but not less than that required to support structural loads.
- B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required: Maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking or otherwise deforming exposed surfaces of handrail and railing components.
- D. Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
-
- E. Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
 - F. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
 - G. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post and steel plate forming bottom closure.
 - H. Ease exposed edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the work.
 - I. Cut, reinforce, drill and tap components, as indicated, to receive finish hardware, screws and similar items.
 - J. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
 - K. Fabricate joints that will be exposed to weather in a watertight manner.
 - L. Close exposed ends of handrail and railing members with prefabricated end fittings.
 - M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.
 - N. Provide 3 inch toe boards at railings around openings and at edge of open-sided floors and platforms.
 - O. Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products: for recommendations for applying and designating finishes.

2.6 STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 1. ASTM A 123, for galvanizing steel and iron products.
 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

- B. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves and other ferrous components.
- C. For non-galvanized steel handrails and railings, provide non-galvanized ferrous-metal fittings, brackets, fasteners and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- D. Preparation for Shop Priming – Galvanized: After galvanizing, thoroughly clean handrails and railings of grease, dirt, oil, flux and other foreign matter, and treat with metallic-phosphate process.
- E. Preparation for Shop Priming – Non-Galvanized: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed handrails and railings:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6, “Commercial Blast Cleaning”.
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, “Brush-Off Blast Cleaning”.
- F. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, “Point Application Specification No. 1”, for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - 1. Strip paint edges, corners, crevices, bolts and welds.
- G. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment and elevation; measured from established lines and levels and free from rack.
 - 1. Do not weld, cut or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Adjust handrails and railings before anchoring to ensure alignment at abutting joints.
- D. Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Form or core-drill holes (no core drilling in composite slab) not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:
 - 1. Non-shrink, nonmetallic grout or anchoring cement.
- B. Cover anchorage joint with flange of same metal as post, attached to post as follows:
 - 1. Welded to post after placing anchoring material.
- C. Leave anchorage joint exposed, wipe off surplus anchoring material and leave 1/8 inch (3 mm) build-up, sloped away from post.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post-installed anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.
 - 1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2 inch (38 mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the installation of Rough Carpentry work as shown on the Drawings and/or as specified herein.

1.2 REFERENCES

- A. American National Standards Institute/American Forest and Paper Association (ANSI/AF&PA) - Permanent Wood Foundation Design Specification
- B. ASTM International (ASTM):
 - 1. A153/A153M - Standard Specification For Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 2. A653 / A653M Standard Specification For Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 3. D3201 Standard Test Method For Hygroscopic Properties of Fire-Retardant Wood and Wood-Base Products
 - 4. D5516 Standard Test Method For Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures
 - 5. D5664 Standard Test Method For Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber
 - 6. D6305 Standard Practice For Calculating Bending Strength Design Adjustment Factors for Fire retardant Treated Plywood Roof Sheathing
 - 7. E84 Standard Test Method For Surface Burning Characteristics of Building Materials
- C. American Wood-Protection Association (AWPA):
 - 1. E12 - Standard method of determining the corrosion of metal in contact with wood
 - 2. M4 - Standard For the Care of Preservative Treated Wood Products
 - 3. P5 - Standard For Waterborne Preservatives
 - 4. P17 - Fire Retardant Formulations
 - 5. P23 - Standard For Chromated Copper Arsenate Type C (CCA-C)
 - 6. P25 - Standard For Inorganic Boron (SBX)
 - 7. P26 - Standard For Alkaline Copper Quat Type A (ACQ-A)
 - 8. P27 - Standard For Alkaline Copper Quat Type B (ACQ-B)
 - 9. P28 Standard For Alkaline Copper Quat Type C (ACQ-C)
 - 10. P29 Standard For Alkaline Copper Quat Type D (ACQ-D)
 - 11. P47 - Standard For DCOI/Imidacloprid/Stabilizer, Waterborne (EL2)
 - 12. P50 Standard For Fire Retardant FR-2 (FR-2)
 - 13. T1 - Use Category System: Processing and Treatment Standard
 - 14. U1 - Use Category System: User Specification for Treated Wood
- D. International Code Council (ICC):
 - 1. International Building Code (IBC)
 - 2. International Residential Code (IRC)
 - 3. Evaluation Report 1851

- E. National Fire Protection Association (NFPA) 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials
- F. Underwriters Laboratories, Inc. (UL) 723 - Tests for Surface Burning Characteristics of Building Materials

1.3 QUALITY ASSURANCE

- A. Provide each piece of lumber or plywood used for structural framing, graded and marked with grade and trademark of a lumber grading organization approved by A.H.J. Trademark of manufacturer shall also appear on each piece.

1.4 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings of fabricated connecting hardware specified herein. General: Submittals requirements are specified in Section 01 3300, Submittal Procedures.

PART 2 PRODUCTS

2.1 LUMBER

- A. Dimensions: Conform to standards established by the American Lumber Standards Committee.
- B. Moisture content: 19% maximum.
- C. Surfacing: S4S.
- D. Grade and species: No. 2 grade and any of the following species:
 - (a) Hem-fir (north); NLGA.
 - (b) Southern pine; SPIB.
 - (c) Douglas fir-larch; WCLIB or WWPA.
 - (d) Mixed southern pine; SPIB.
 - (e) Spruce-pine-fir; NLGA.
 - (f) Douglas fir-south; WWPA.
 - (g) Hem-fir; WCLIB or WWPA.
 - (h) Douglas fir-larch (north); NLGA.
 - (i) Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA
- E. Non-structural framing (non-load bearing):
 - 1. Any species and grade with a modulus of elasticity of at least 1,000,000 psi and an extreme fiber stress in bending of at least 450 psi.
- F. Structural framing (load bearing):
 - 1. Any species and grade with a modulus of elasticity of at least 1,400,000 psi and an extreme fiber stress in bending of at least 875 psi.
- G. Light framing (less than 6" wide):
 - 1. "Stud" grade for stud framing.
 - 2. "Standard" grade for other light framing, any species.
- H. Exposed framing lumber (2" through 4" thick) where framing will not be concealed by other

work, provide the following:

1. Douglas Fir, Appearance Framing or (WWPA).
2. Southern Pine, Appearance Grade, KD (SPIB).
3. Redwood, Clear All Heart (RIS).

I. Wood backing and blocking:

1. Minimum 2 x 6 Utility Grade lumber backing to be used for support of all horizontal and vertical edges of wall mounted items unless noted otherwise.

J. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than nominal thickness.

K. Connecting Hardware:

1. Nails: Common wire, galvanized for exterior Work, meeting Federal Specification FF-N-101 of the sizes indicated on the Drawings and or as published in applicable industry standards.
2. Screws: Standard domestic manufacture, bright steel, except galvanized for exterior use and of brass, bronze, aluminum or stainless steel when used to attach items made of those materials for attaching interior trim and finish to drywall partitions shall be Type S self-drilling, self-tapping anodized steel drywall screws of required lengths as specified in Section "Gypsum Board".
3. Bolts, lag screws, sheer plates and split ring connectors: Conforming to the requirements of the "National Design Specifications for Stress Grade Lumber and its Fastenings" of National Forest Products Association and complying with ; with hex nuts and washers.
4. Framing anchors, joist hangers, etc.: Products or devices as approved by authorities having jurisdiction; see Drawings for specified items.
5. Miscellaneous clips, steel assemblies: Conforming to ASTM A36 with hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, coating designation galvanized after fabrication.
6. Sill-sealer gaskets: Glass-fiber or neoprene resilient insulation fabricated in strip form for use as a sill sealer selected from manufacturer's standard widths to suit width of sill members indicated.

2.2 ROOF SHEATHING

A. APA rated sheathing for use and exposure.

2.3 MISCELLANEOUS MATERIALS

A. Fire-Retardant Treatment: Where required by code (in non-combustible or "one-hour" classified construction) or where shown on the Drawings, wood studs, plates, sheathing, blocking, etc. shall be pressure treated with any fire-retardant treatment acceptable to the authorities having jurisdiction. Hoover "Pyro-Guard: shall be the "Basis of Design".

1. Fire-retardant treated wood shall be labelled as required by the Code and bear the UL Classification mark.
2. Use Interior Type A for all interior uses unless otherwise indicated and exterior type for exterior locations.
3. Provide classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

B. Wood Preservative Treatment: Wood in direct contact with concrete or masonry or as indicated on the Drawings, shall be pressure treated with CCA type treatment equal to Koppers Co. "Wolman CCA" in accordance with applicable Building Code Standard.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of all parts is required. Before commencing Work, check lines and levels indicated and such other Work as has been completed. Any discrepancies shall be immediately reported, in writing, to the Architect. In event of failure to do so, the Contractor shall be responsible for correction of any error.

3.2 FRAMING

- A. Coordination: Install wood framing making proper provisions for Work of other Trades. Do cutting of wood required to accommodate plumbing, heating and ventilating, electrical and other Trades. Fit neatly around exposed items, as outlet boxes, conduit, pipes and ducts. Protect adjacent Work. Before proceeding with rigid sheathing, make certain required inspections have been made.
- B. Rough framing: Fit closely, set accurately to required lines and levels, and secure rigidly in place. Set horizontal and inclined members with crown edge up. Reinforce cut members as directed. Structural members shall provide full contact at bearing surfaces. No cutting, notching or drilling of structural members will be allowed without prior approval of the structural engineer.
 - 1. Studs: Wall and partitions shall be nominal 2x4 and 2x6 studs 16 inches on center unless otherwise noted or unless they are required to be larger to accommodate mechanical or electrical equipment, piping and fixtures or equipment of any other Trade.
 - 2. Bottom plates shall be predrilled where required for anchorage. All plates for exterior walls shall be installed over full-width sill gasket material.
 - 3. Top plates in bearing partitions shall be doubled and lapped at each intersection with walls or partitions. Stagger joints in upper and lower members of top plate not less than 4 feet.
 - 4. Frame corners solid where stud walls or partitions meet or as shown on the Structural Drawing.
 - 5. At roofs, provide crickets, cants, equipment curbs, wood saddles or crickets, can't strips, curbs for plywood at parapet walls, other miscellaneous backing, blocking, curbing, etc., and wood nailers bolted to tops of concrete or masonry and at expansion joints where necessary whether shown on Drawings or not.
 - 6. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
 - 7. Pre-drill and provide galvanized steel washer under lag screw and bolt heads when they bear on wood. Re-tighten bolts immediately prior to concealing with finish Work.
- C. Wood Backing: Provide and install all wood backing, furring, stripping or blocking indicated or required for installation and attachment of Work of other Trades. Wood backing shall be provided for but not limited to, rooftop equipment supports, curbs and cants, furring, cabinetry, shelving, chalk and marker boards, urinals, lavatories, drinking fountains, toilet room partitions and accessories, fire extinguisher cabinets, and wall-mounted door stops.
 - 1. Horizontal backing shall be secured between studs or furring members flush with back side of gypsum board or specified wall material. Backing for door stops shall be horizontal, not vertical.
 - 2. Vertical backing material shall be continuous, flush with the back side of gypsum board or specified wall material and secured to adjacent studs, furring members, or masonry substrate at the proper location to support the edges of each item.

3. Provide approved fire-retardant treated wood backing in walls where required to be of non-combustible or fire rated construction.
 4. Install 1/2 inch treated plywood nailer at the sides of non-nailable skylights, roof hatches, equipment curbs, back of masonry reveals, etc.
- D. Firestopping: Provide firestop blocking in concealed spaces of partitions and furred spaces 10' on center vertically and horizontally. Provide blocking that results in a barrier between walls and floors, between walls and roof, and in other concealed spaces where firestopping is necessary. Provide firestop blocking in the joist space where plumbing penetrations, including at tubs and toilets, penetrate the subflooring in a rated floor/ceiling assembly. Provide blocking around openings at vents, pipes, ducts, chimneys, and fireplaces at ceiling and floor levels. Provide fire blocking at ceiling line at dropped ceilings.
- E. Plywood sheathing: Install with the long dimension of the panel across supports, except where noted, and with panel continuous over two or more spans. Suitable edge support shall be provided where indicated on drawings and in recommendations of the American Plywood Association by use of panel clips, tongue-and-groove panels, or lumber blocking between joists. Staggered panel end joints shall occur over framing. Provide solid edge blocking between sheets. Allow 1/8" spacing at panel ends and 1/4" at panel edges, unless otherwise recommended by the panel manufacturer.

3.3 CLEANING

- A. Remove wood, including form lumber, scrap lumber, shavings and sawdust in contact with ground. Leave no wood buried in any fill or backfill.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 06 4000

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fabricated custom casework, high pressure decorative laminate finish.
 - 2. Fabricated custom countertops, high pressure decorative laminate finish.
 - 3. Cabinet hardware.
 - 4. Storage shelving or bookshelves.
 - 5. Sample Cabinets Delivered to Architect.
- B. Related Sections:
 - 1. Section 06 1000 - Rough Carpentry: Blocking and backing for cabinet attachment.

1.2 REFERENCES

- A. Americans with Disabilities Act (ADA):
 - 1. ADA - Americans with Disabilities Act; Federal Register, Volume 56, No. 144 28 CFR part 36.
- B. American National Standards Institute (ANSI):
 - 1. ANSI/ICC A117.1 - American National Standard for Accessible and Useable Buildings and Facilities; International Code Council.
 - 2. ANSI A208.1 - American National Standard for Particleboard.
- C. Architectural Woodwork Institute (AWI):
 - 1. AWI AWS – Architectural Woodwork Standards; Edition 1.
- D. Builders Hardware Manufacturers Association (BHMA):
 - 1. BHMA A156.9 - American National Standard for Cabinet Hardware.
- E. National Institute of Standards and Technology (NIST) (U.S. Department of Commerce):
 - 1. NIST PS 1 - Construction and Industrial Plywood.
 - 2. NIST PS 20 - American Softwood Lumber Standard.

1.3 DEFINITIONS

- A. AWI Premium Grade: Refer to AWI AWS Section 10, Paragraph 1.1.4
- B. AWI Custom Grade: Refer to AWI AWS Section 10, Paragraph 1.1.3
- C. Exposed Parts, Semi-Exposed Parts and Concealed Surfaces: Refer to Refer to AWI AWS Section 10, Paragraph 1.2.10, 1.2.11, and 1.2.12.
- D. Flush Overlay: Refer to AWPI AWQS, Section 400, Paragraph 400-G-7.

1.4 SUBMITTALS

- A. Section 01 3300 - Submittal Procedures: Requirements for submittals.
 - 1. Product Data: Submit manufacturer's data for each cabinet hardware item.
 - 2. Shop Drawings: Indicate plans and elevations, materials, profiles, assembly

- methods, joint details, fastening methods, accessories, hardware and finishes.
- 3. Samples for Selection:
 - a. Submit manufacturer's complete set of plastic laminate color samples for Architect initial color selection.
 - b. Submit manufacturer's complete set of solid surfacing color samples for Architect initial color selection.
- 4. Samples for Verification: Submit plastic laminate sample to illustrate color and texture for comparison with and determination of match with existing plastic laminate.
- 5. Assurance/Control Submittals:
 - a. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.
- B. Section 01 7700 - Closeout Procedures & Checklist: Procedures for closeout submittals.
 - 1. Warranty: Submit written warranty with forms completed in Owner's name and registered with manufacturer as specified in this Section.
 - 2. Installation Certification: Submit written certification of installation on form located at end of Section.

1.5 QUALITY ASSURANCE

- A. AWI Quality Standard: Comply with grades of interior architectural woodwork, construction, finishes and other requirements of the "Architectural Woodwork Standards", 2nd Edition, 2014, adopted and published jointly by Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturers Association of Canada (AWMAC), and Woodwork Institute (WI), except as otherwise indicated.
 - 1. Use Premium Grade, except use Economy Grade for millwork in custodian closets and storage rooms. Items not given a specific quality grade shall be Premium Grade.
- B. Mock-up: Construct the mock-up cabinet as designated on the drawings using materials and hardware proposed for the project. The cabinet shall duplicate the typical construction and quality grade specified. Deliver the mock-up cabinet to the project site for approval by Architect. Notify the Architect in writing one week in advance of the mock-up's on-site arrival. Mock-up cabinet shall be made fully acceptable to the Architect through re-manufacture at the millwork shop or through acceptable field corrections prior to commencing construction of other cabinets. Mock-up cabinet shall be properly identified, and, if acceptable to Architect may be installed in the project. Once installed, do not alter or move the mock-up cabinet.
- C. Lumber and Plywood Material Grading: As defined in AWI Section 4 - Sheet Products, and as defined by the rules of the recognized associations of lumber and plywood manufacturers producing the materials specified.
- D. Color Uniformity: Provide plastic laminate for laminate-clad millwork from the same manufacturer.
- E. Fabrication Standards: Fabricate items in accordance with AWI standards listed below using Premium Grade except at millwork scheduled to be installed in Custodian's Closets and storage rooms, which shall be Economy Grade.
 - 1. Lumber grades: AWI Section 3 - Lumber.
 - 2. Miscellaneous Work: AWI Section 6 - Interior & Exterior Millwork.
 - 3. Painted Millwork: AWI Section 10 - Casework.
 - 4. Countertops: AWI Section 11 - Countertops.

- F. Regulatory Requirements: Conform to applicable code for fire retardant requirements.
- G. Accessibility Standards: Meet Texas Accessibility Standards (TAS) special requirements for the following:
 - 1. Countertop height with or without cabinet below
 - 2. Kneespace clearance to be minimum clearance
 - 3. 12 inch deep shelving, adjustable and fixed
 - 4. Wardrobe cabinets, furnished with rod/shelf adjustable to 48 inches above finished floor, with a maximum 21 inch shelf depth.
 - 5. Sink cabinet clearances
 - 6. Cabinet locks, latches, and other operating mechanisms, except locked bottom drawers at base cabinets.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 6000 - Product Requirements: Transport, handle, store and protect products.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Deliver Material Safety Data Sheet (MSDS) for each material to Project Field Superintendent for Contractor Records.
- D. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- E. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.
- F. Store under cover in ventilated space not exposed to extreme temperatures and humidity changes.
- G. Do not store or install units in building until concrete, masonry and gypsum board work is dry, and temperature and humidity are stabilized.

1.7 PROJECT CONDITIONS

- A. Environmental Requirements: During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.
- B. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying Work.

1.8 COORDINATION

- A. Coordinate dimensions, weights, required utilities and support requirements for equipment, fixtures and appliances installed in and on cabinets.
- B. Coordinate with other trades performing installations with cabinets to provide for a complete concealed installation.

1.9 WARRANTY

- A. Section 01 7700 - Closeout Procedures: Procedures for closeout submittals.
- B. Manufacturer Warranty: Manufacturer two (2) year warranty covering defects in materials and workmanship.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

- A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI AWS Section 3, Custom Grade; average moisture content of 6-8 percent.
- B. Hardwood Lumber and Trim: Graded in accordance with AWI AWS Section 3, Custom Grade; average moisture content of 6-8 percent.

2.2 LAMINATE MATERIALS -MANUFACTURERS

- A. Subject to compliance with project requirements, provide Laminate Materials as manufactured by one of the following:
 - 1. Formica: www.formica.com
 - 2. Nevamar, International Paper: www.nevamar.com.
 - 3. Pionite: www.pionite.com.
 - 4. Wilsonart: www.wilsonart.com.
 - 5. Section 01 6000 - Product Requirements: Product options and substitutions. Substitutions: Permitted.
- B. Laminate Countertop: AWI AWS, Horizontal General Purpose Standard (HGS) Grade; 0.048-inch thick, decorative plastic laminate.
- C. Laminate Plastic at Knee Spaces: AWI AWS, Vertical General Purpose Standard (VGS) Grade, 0.028-inch thick, decorative plastic laminate.
- D. Laminate Plastic Back and Side Splashes: AWI AWS, Vertical General Purpose Standard (VGS) Grade, 0.028-inch thick, decorative plastic laminate.
- E. Laminate Backing Sheet: AWI AWS, Backing Sheet (BKL) grade, 0.20-inch thick, undecorated plastic laminate.
- F. Laminate Cabinet Liner: AWI AWS, Cabinet Liner Standard (CLS) grade, 0.20-inch thick, undecorated plastic laminate.
- G. Thermoset Decorative Overlay: Low pressure decorative laminate (melamine) pre-laminated by thermal fusion to particleboard to form manufactured panel.
- H. Colors: As shown in drawings.

2.3 ACCESSORIES

- A. Adhesive: Type recommended by AWI to suit application.
- B. Fasteners: Size and type to suit application.

- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application.
- D. Grommets: 3-inch diameter molded plastic for equipment cords and cabling to pass through.
 - 1. Color selected by Architect. More than one color may be selected.

2.4 HARDWARE

- A. In addition to the items of hardware specifically noted and shown on the drawing details, furnish and install the following hardware for cabinets. This schedule is intended to include hardware needed to completely equip cabinets specified in this Section. Verify cabinets shown and detailed on the drawings with cabinets listed in this schedule. In the event of omissions in the schedule, furnish hardware of the kind and quality scheduled for similar cabinets.
 Each 3/4-inch overlay cabinet door more than 3 feet high:
 1-1/2 pair concealed hinges #91A6550 (91A6650 at twin applications) screw-on, self-closing, slide-on Modul Hinge with 195H7100 Series (195H9100 Series at twin applications) screw-in Mounting Plate for Modul Hinge (Blum).
 1 wire pull 4484 satin aluminum (Stanley). 1 pair Magnetic Catches: 325 (Ives).
 1. Each 3/4-inch overlay cabinet door less than 3 feet high:
 1 pair concealed hinges #91A6550 (91A6650 at twin applications) screw-on, self-closing, slide-on Modul Hinge with 195H7100 Series (195H9100 Series at twin applications) screw-in Mounting Plate for Modul Hinge (Blum).
 1 wire pull 4484 satin aluminum (Stanley). 1 pair Magnetic Catches: 325 (Ives).
 2. Each 1-1/2 inch overlay cabinet door more than 3 feet high:
 1-1/2 pair concealed hinges #91M9550 (91M9650 at twin applications) screw-on, self-closing slide-on Module Hinge with 195H7100 Series (195H9100 Series at twin applications) screw-in Mounting Plate for Modul Hinge (Blum).
 1 recessed pull Catalog No. 158.88.0 (Hewi Häfele) (Color as selected by Architect.) 1 flap stay No. 499.050.02.0215 or 499.050.03.0215 (Mepla) 1 pair Magnetic Catches: 327 (Ives).
 3. Cabinet Doors with Piano Hinge:
 Piano Hinge: Stainless Steel, one piece, full width of cabinet.
 1 pair Magnetic Catch Ives No. 327.
 4. Each cabinet drawer:
 KV #1300 Extension Drawer Slides.
 KV #8400 Extension Drawer Slides at File Drawers.
 1 wire pull 4484 satin aluminum (Stanley)
 5. Cabinets indicated to be locked:
 a. Each cabinet door: C8055-14A x C2004 US26D (CompX National)
 b. Each drawer: C8055-14A x C2004 US26D (CompX National)
 c. Each pair of cabinet doors:
 1 cabinet lock C8053-14A x C2004 US26D (CompX National)
 1 elbow catch No. 2 (Ives)
 d. Cabinet locks in each room shall be keyed alike.
 6. Shelf and Rod Hardware:
 1 hanger rod KV660SS
 1 shelf and rod support KV1195
 2 rod flanges KV734

7. Grommets: Model No. LO-3 (Doug Mockett & Co., Inc.)
8. Pencil Drawer: Mepla Pencil Drawer, ref. No. 499.405.05.10, color as selected by Architect.
9. Keyboard Tray: Knappe & Vogt SD-04-18 Keyboard/Mouse, 6" adjustable arm, 18" track and 25" keyboard/mouse platform to accommodate right or left hand mousing.
10. Coat Hooks: Model No. 580-A26 Wardrobe Hooks (Ives)
11. Steel Support Brackets (for countertops): Provide one of the following:
 - a. Work Station Brackets formed of 1/8-inch steel with powder coat finish as manufactured by A & M Hardware, Inc. (phone 888.647.0200 web site: www.aandmhardware.com). Color as selected by Architect from manufacturer's full color line.
 - b. Rakks Counter Support Brackets fabricated of minimum 0.25-inch gauge 6063-T6 extruded aluminum as manufactured by Rangine Corp. (phone 800.826.6006 web site: www.rakks.com). Brackets shall be TIG welded along both 45° mitered sides and across the back. Sharp edges shall be ground and deburred. Color and finish shall be as selected by Architect.

2.5 CONSTRUCTION - PLASTIC LAMINATE FINISH CABINETS

- A. Construction Workmanship: Comply with workmanship requirements in AWI AWS, Section 10.
- B. Joinery of Case Body Members:
 1. Tops, Ends and Bottoms: Spline or biscuit, glued under pressure, approximately (3) per each 12 inches of joint.
 2. Exposed End Corner and Face Frame Attachment: Butt joint, glued and finish nailed.
 3. Cabinet Backs: Full bound captured in grooves on cabinet sides, top and bottom.
- C. Construction: Flush Overlay.
 1. Door and drawer faces cover body members or face frames of cabinets, with spaces left between adjacent surfaces sufficient for operating clearance.
- D. Sub-base: Kiln dried solid lumber.
- E. Body Members (Ends, Divisions and Bottoms): 3/4-inch particleboard panels.
 1. Ends: Provide holes drilled for adjustable shelves spaced 32mm on center.
- F. Face Frames and Rails: 3/4-inch hardwood lumber
 1. Minimum (5) inch x full width cabinet body rails immediately behind door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, close-off reveal and locate for lock strikes.
- G. Fixed and Adjustable Shelving: Particleboard panels.
 1. Up to 35 Inches Wide: 3/4 inch thick.
 2. 36 Inches and Above: 1 inch thick.
 3. Tall Cabinets: 1 inch thick.
- H. Cabinet Backs: 1/2-inch particleboard, fully housed into sides, top, and bottom, recessed 7/8 inch from back of cabinet.
 1. Provide hang rails glued to back of cabinet back and mechanically fastened to cabinet sides. Provide minimum of one (1) at base, two (2) at wall, and three (3) at tall cabinets.
- I. Drawer Sides, Backs and Sub-fronts: AWI AWQS, Premium Grade; 1/2-inch single

species solid lumber with an AWI AWQS Section 100-G-1 hardness rating of "Medium" or better.

1. Fronts applied to separate drawer body components sub-front.
2. Sides doweled and glued under pressure to receive front and back, machine squared and clamped until glue is set.
3. Paper storage drawers fitted with full width hood at back.
4. Pre-manufactured drawer systems not permitted.
5. Particleboard not permitted.

J. Drawer Bottoms: AWI AWQS, Premium Grade; 1/2-inch non-racking, non-deflecting single species solid lumber with AWI AWQS Section 100-G-1 hardness rating of "Medium" or better.

1. Secure bottom to drawer sides by gluing under pressure and with screws.

K. Door and Drawer Fronts: 13/16-inch-thick laminated particleboard.

1. Drawer fronts and hinged doors overlay cabinet body.
2. Maintain maximum 1/8-inch reveal between pairs of doors and between multiple drawer fronts within cabinet.

L. Storage Shelving:

1. Sub-base: Kiln dried solid lumber.
2. Body Members (Ends, Divisions, Tops and Bottom): 3/4-inch particleboard panels.
 - a. Ends: Provide holes drilled for adjustable shelves spaced 32mm on center.
3. Backs: 3/4-inch particleboard.
4. Adjustable Shelves: Particleboard panels.

M. Edging:

1. Door and Drawer Fronts: Plastic laminate, VGS Grade.
2. Cabinet Body Edge (Includes door/drawer front spacer rail): Plastic laminate, VGS Grade.
3. Drawer Body: Plastic laminate, VGS Grade.
4. Fixed Shelves: Plastic laminate, VGS Grade.
5. Adjustable Shelves (All 4 edges): Plastic laminate, VGS Grade.
6. Interior Body Compartment Edging and Interior Dividers: Plastic laminate, VGS Grade.

N. Access: Coordinate requirements of electrical components installed under Divisions 26 – Electrical. Provide under this Section access to electrical components installed within casework.

1. Provide removable access panel within knee space for access to electrical components. Secure in place using appropriate wood fasteners.
2. Construct access panel as large as practical for easy of access and manageability to match adjacent casework construction.
3. Provide perimeter edging on removable panel to prevent edge damage.

O. Finishes:

1. Exposed Parts: Plastic laminate VGS Grade.
2. Semi-Exposed Parts (other than edges): Thermoset decorative overlay.
3. Shelves: Laminate cabinet liner bonded to top and bottom surfaces.
4. Door Backs: Laminate backing sheet.
5. Knee Space Backs: Plastic laminate VGS Grade.

2.6 CONSTRUCTION – SOLID SURFACE COUNTERTOPS

1. Substrate shall be plywood.
2. Provide 1/8-inch radius at outside corners and edges, unless otherwise recommended by manufacturer.
3. Provide 1/4-inch radius at inside corners, where required to prevent cracking.
4. Provide manufacturer's "best result" recommendations for sanding.
5. Provide a semi-gloss finish. Notify Architect before finishing, if manufacturer's finish recommendations for material color selected differ from semi-gloss.

2.7 FABRICATION

- A. Shop fabricate and assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Shop fabricate units square, plumb and true.
- C. Accurately machine and bore cabinet parts for specified grade quality joinery construction utilizing automatic machinery providing consistent sizing of components. End panels doweled to receive bottom and top.
- D. Fully house and recess back panel 7/8-inch into back of cabinet sides, top and bottom forming fully closed and rigid cabinet. Shim cabinet back from back of cabinet creating tight interior fit.
- E. Laminate surfaces and liners to core under controlled conditions, by approved and regulated lamination using natural-setting hybrid P.V.A. Type III water resistant adhesives that cure through chemical reaction, containing no health or environmentally hazardous ingredients. Methods requiring heat are not permitted, "contact" methods of laminating not permitted.
- F. Use one piece edging for full length only. Joints not permitted.
- G. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- H. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
- I. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces and at cabinet interior surfaces.
- J. Provide counter tops with edge treatment and profile indicated on Drawings. Provide in continuous lengths to maximum possible. Provide field joints as required using adhesive and tight-joint fasteners. Joints within 24 inches of sink cut-out not permitted.
- K. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.
- L. Provide concealed conduit chases, removable access panels, cutouts for plumbing fixtures, inserts, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions and where directed by Owner's Representative.

- M. Provide openings and required supports for equipment, fixtures and appliances installed in cabinets. Verify sizes and other requirements before fabrication.
- N. Provide cabinet door locks at each door and drawer where indicated on Drawings. Provide concealed vertical cabinet frame member where pairs of cabinet doors meet for lockstrike.

2.8 LOCKER BENCHES

- A. Fabricate locker benches of solid Hard White Maple, minimum 11-1/2 inches wide by 1-1/2 inches thick and lengths not less than 6 feet, with rounded corners and edges. Furnish steel pedestal supports not more than 6'-0" o.c., with provisions for fastening to floor and securing to bench. Finish wood tops with one coat of clear sealer on surfaces and two coats of clear lacquer on top and sides. Finish pedestals with baked enamel finish. Provide all anchors required for anchoring benches to floor.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Execution: Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work.
 - 1. Verify adequacy of backing and support framing for attachment of cabinets.
 - 2. Verify mechanical, electrical, and building items affecting Work of this section and ready to receive this Work.
- C. Report in writing to Architect and Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions are corrected.
- D. By starting Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to Owner.

3.2 INSTALLATION

- A. Install Work in accordance with specified AWI Quality Standards.
- B. Set and secure casework in place; rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.3 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Meet and coordinate with Electrical and Plumbing Contractors to locate required cut- outs for fixtures, outlets and other items not installed by Cabinet Contractor.
 - 2. Determine exact location of electrical and piping runs within cabinets for a complete concealed installation.

3.4 FIELD QUALITY CONTROL

- A. Section 01 4500 - Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 - 1. Inspect cabinet work construction for specified grade, configuration, finish and color, specified hardware, anchorage and installation for compliance with specified standards.
 - 2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 3. Test and Inspection Reports shall be available to Architect upon request.
- B. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

3.5 CLEANING

- A. Clean casework, shelves, hardware, fittings, and fixtures.
 - 1. Upon completion of installation.
 - 2. Just before Substantial Completion Inspection.

END OF SECTION

CUSTOM CABINETS INSTALLATION CERTIFICATION

PROJECT: _____

LOCATION: _____

ARCHITECT'S PROJECT NUMBER: _____

OWNER: _____

CONTRACTOR: _____

CUSTOM CABINET INSTALLER:

Name: _____

Address: _____

Telephone Number: _____

UPON COMPLETION OF INSTALLATION INSTALLER CERTIFIES THAT:

1. Installer furnished and installed cabinets constructed with specified materials in conformance with AWI Custom Grade requirements.
2. Installer furnished and installed drawers in cabinets constructed with specified materials in conformance with AWI Premium Grade requirements.
3. Installer furnished and installed countertops in accordance with AWI; Section 11, Paragraph 4.2.5.3.1 where countertops receive sinks, lavatories or where countertops are subject to liquids.
4. Installer furnished and installed plastic laminate material of specified grade in conformance with AWI Custom Grade requirements.

EXECUTED AND DELIVERED this _____ day of _____, 20____.

(company name)
BY: _____
(authorized

signature) Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission
expires:

Affix Seal

END OF CERTIFICATION

SECTION 06 8200

GLASS FIBER REINFORCED PLASTIC

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install Glass Fiber Reinforced Plastic panels (FRP) as shown on Drawings and/or as specified herein.

1.2 REFERENCES

- A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- B. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit manufacturer's product data for panels and trim.
- C. Submit two (2) samples of panel and trim specified herein for approval prior to delivery of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements provide products from one of the following:
 - 1. Crane Composites
 - 2. Glasteel
 - 3. Marlite

2.2 MATERIALS

- A. Fiberglass Reinforced Panels:
 - 1. Panel thickness: .125 (3.0mm) thick.
 - 2. Panel width and height: 4 foot 0 inch x 5 feet 0 inch.
 - 3. Panel and trim color: to be selected by Architect from manufacturer's full line of colors. Color: as indicated on the Drawings.
 - 4. Surface pattern to be pebbled.
 - 5. Panels shall have normal water absorption property of 0.16% and a normal coefficient of linear expansion of 1.50×10^{-5} to 2.50×10^{-5} in./in. F° when tested per ASTM D696.
 - 6. Panels shall be "Class A" fire rated per ASTM E84. Flame shall spread less than 25, smoke developed 450 or less and meet all building and health code requirements.

- B. Trim (edge, seam, termination strips)
 - 1. Rigid plastic profiles molded from virgin PVC in sizes and shapes as required to provide a complete installation. Color to match wall panels unless noted otherwise. Provide in full lengths with a minimum of joints.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Installer to examine supporting wall structure and conditions prior to installation off panels and notify the Contractor, in writing, of any conditions detrimental to proper and timely completion of work. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.2 INSTALLATION

- A. Install panels per manufacturer's printed instructions.
- B. Install panels plumb and level with all edges tightly butted and fit to trim extrusions on all sides.
- C. Install panels vertically and continuous from floor to ceiling with no horizontal seams. Coordinate installation of floor base with installer.
- D. Apply clear silicone sealant at all intersections of dissimilar materials and as recommended by wall panel manufacturer for application.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 2100

THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install fiberglass Thermal Insulation work as specified herein.
 - 1. Unless otherwise noted all exterior walls shall be insulated to a value of R-19.
 - 2. Unless otherwise noted all roof assemblies shall be insulated to a value of R-30.

1.2 REFERENCES

- A. ASTM C665 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction
- B. ASTM C1304 - Standard Test Method for Assessing the Odor Emission of Thermal Insulating Materials
- C. ASTM C1338 - Standard Test Method for Determining Fungi resistance of Insulation Materials and Facings

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit technical data sheets for each type of insulation and membrane.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fiberglass Insulation: Except as otherwise specified herein, or specifically approved by Architect, thermal batt insulation shall be products of one of the following manufacturers, subject, however, to compliance with specification requirements.
 - 1. Certaineed
 - 2. Johns-Manville
 - 3. Knauff
 - 4. Owens Corning Fiberglass
- B. Vapor and convection retarder membrane: Except as otherwise specified herein, or specifically approved by Architect, facing material membranes for unfaced batt insulation shall be products of one of the following manufacturers, subject, however, to compliance with specification requirements.
 - 1. Lamtec Corp.

2.2 MATERIALS

- A. Fiberglass Batt Insulation:
 - 1. Unfaced: Shall comply with ASTM C665, Type 1, (formaldehyde free) meeting ASTM C1304 (Odor Emission) and ASTM C1338 (Fungi Resistance).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.2 INSTALLATION

- A. Batt Insulation
 - 1. Apply no insulation until such time as the Construction has progressed to the point that inclement weather will not damage or wet the insulation material.
 - 2. Small areas between closely spaced framing members, pipes, conduits or other obstruction shall be fully insulated by cutting and fitting insulation material as required to maintain the integrity of the insulation with no gaps or voids.
 - 3. Batt insulation at metal studs, and other non-nailable members shall be installed tight against framing members with no gaps or voids, securing in place with wire or other method as approved by Architect.
 - 4. All end matching shall be done neatly with all ends fitting snugly or overlapped with no gaps or voids.
 - 5. Provide vapor and convection retarder membrane material under all unfaced fibrous insulation under roof or floor decks and at the interior face of all walls where not covered by gypsum wallboard or other form of convection barrier.
 - 6. Vapor/convection barriers shall be installed directly against insulation layer with no gaps or overlaps and shall be secured to the framing members with approved fasteners.
 - 7. Convection barriers shall be taped or suitably sealed around all structural, electrical, mechanical penetrations. All seams shall be taped with the approved material and perimeters sealed in an approved manner so that vapor and convection transmission is completely blocked.
 - 8. Provide fire rated protection over light fixtures as required per insulation manufacturer's data.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 2115
BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of extruded polystyrene Board Insulation.

1.2 REFERENCES

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- B. ASTM C177 - Standard Test Method for Steady- State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
- C. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics
- D. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics
- E. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- F. ASTM E119 - Standard Test Method for Fire tests of Building Materials
- G. NFPA 285 - Standard Fire test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components

1.3 QUALITY ASSURANCE

- A. Single source responsibility for insulation products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. The rated R-value shall be clearly identified by an identification mark applied by the manufacturer to each piece of building envelope insulation.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Manufacturer's product data indicating density, insulating value, water absorption characteristics and recommended adhesive for the application.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- 1. Dow Styrofoam
- 2. Owens Corning

3. An approved equal
- A. Description:
 1. Rigid, HCFC free, extruded polystyrene.
 2. Compressive strength: 25 lbs./sq. in. , min.
 3. Water absorption: 0.3% by volume, max.
 4. R-value: 5.0 deg. F./ft. sq./hr/Btu/in. min.
 5. Thickness: As required to meet 7.5 R-Value. (available in ½" increments from 1" to 3").
 6. Edge Condition: square

2.2 ADHESIVE

- A. Type as recommended by the insulation manufacturer for the application involved.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that substrate and adjacent materials, and insulation boards, are dry and ready to receive insulation and adhesive.
- B. Verify that substrate is flat and free of irregularities and materials that will impede adhesive bond.

3.2 INSTALLATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 2726

FLUID-APPLIED MEMBRANE AIR BARRIER

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Fluid-Applied Membrane Air Barrier to the exterior wall system.

1.2 REFERENCES

- A. ASTM E96 - Test Methods for Water Vapor Transmission of Materials
- B. ASTM E1186 - Practice for Air Leakage Site Detection in Building envelopes and Air Retarder System
- C. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials
- D. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.3 PERFORMANCE REQUIREMENTS

- A. Membrane air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joint, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1.4 QUALITY ASSURANCE

- A. The applicator shall be an ABAA-licensed contractor, employs certified and registered installers, and complies with ABAA's Quality Assurance program.
- B. Pre-installation Conference: Conduct conference at Project site. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers
- C. Membrane manufacturer's representative shall visit the project during the installation process and upon completion and shall provide a written report regarding the quality and suitability of the work.
- D. Components used shall be sourced from one manufacturer, including sheet membrane, air barrier sealants, primers, mastics, flashings and adhesives.
- E. Construct mockup of typical exterior wall assembly incorporating backup wall construction, external cladding, typical window or door frame, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations and penetrations of barrier membrane. Test mock-up for water infiltration.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Include manufacturer's written technical data; and tested physical and performance properties of air barrier.
- C. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
- D. Qualification Data: Provide evidence that applicator is trained and qualified by manufacturer to install product and as outlined below.

PART 2 PRODUCTS

2.1 AIR BARRIER

- A. Manufacturers
 - 1. Subject to compliance with requirements, membrane barrier and associated accessory products shall be manufactured by one of the following:
 - a. BASF Corporation; "Enershield-HP"
 - b. GCP Applied Technologies Inc, Perm-A-Barrier VPL
 - c. Henry Company; Air-Bloc 17 MR
 - d. PROSOCO, Inc. R-Guard Cat 5
 - e. Sika Corporation; "Sikagard 530"
 - f. Tremco Incorporated; ExoAir 230
 - g. W.R. Grace; "Perm-A Barrier"
- B. Manufacturers
 - 1. Subject to compliance with requirements, membrane barrier and associated accessory products shall be manufactured by one of the following:
 - 2. GCP Applied Technologies Inc, Perm-A-Barrier VPO
 - 3. Henry Company, Sealants Division. Air-Bloc 33MR

2.2 ACCESSORY MATERIALS

- A. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.
- D. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. GE Construction Sealants; Momentive Performance Materials Inc US11000 UltraSpan.
 - c. Pecora Corporation; Sil-Span.
 - d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.
- E. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."
- F. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

3.2 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 4. Verify that masonry joints are flush and completely filled with mortar.
 5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- B. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

3.4 AIR BARRIER MEMBRANE INSTALLATION

- A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

- C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Re-prime areas exposed for more than 24 hours.
- D. Apply a continuous unbroken air barrier to substrates according to air barrier manufacturer's written instructions. Apply membrane in full contact around protrusions such as masonry ties, electrical conduits, piping, etc.
- E. Apply strip and transition strip over cured air membrane overlapping 3 inches (75 mm) onto each surface according to air barrier manufacturer's written instructions.
- F. Do not cover air barrier until it has been tested and inspected by Owner's testing agent.
- G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

3.6 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions. Protect from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than 60 days.
- B. Clean spills stains and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 4000

ROOFING AND SIDING PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes preformed and prefinished Roofing and Siding Panels, miscellaneous trim, flashings, underlayment and accessories required for a complete installation.

1.2 REFERENCES

- A. American Iron & Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members
- B. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- D. ASTM C1289 - Specifications for Faced Rigid Cellular Polyisocyanurate Thermal Insulating Board
- E. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
- F. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
- G. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
- H. American Iron and Steel Institute (AISC) - Steel Construction Manual
- I. SMACNA – Sheet Metal and Air Conditioning Contractors' National Association
- J. Underwriters Laboratories, Inc. (UL) - Tests for Uplift Resistance of Roof Assemblies

1.3 QUALITY ASSURANCE

- A. Manufacturer: company specializing in architectural sheet metal products with ten (10) years minimum experience.
- B. Installer of the system shall be an approved installer, certified by the manufacturer, and meet the following minimum criteria:
 - 1. Project foreman is the person having received specific training in the proper installation of the specified system and will be present to supervise whenever material is being installed.
 - 2. Provide certification letter that installer has a minimum of three (3) years of metal product installation experience immediately preceding the date upon which work is to be commence.

- C. Pre-Roofing Conference: Approximately two (2) weeks prior to scheduled commencement of roofing installation and associated work. Attendees shall include the Owner, Architect, Contractor, contractor's applicator foreman, manufacturer's representative, installers of deck or substrate construction to receive roofing work, installers of roof-top equipment and other work in and around roofing that must precede or follow roofing work. Review methods and procedures related to roofing work, including, but not limited to the following:
1. Roofing substrates (decks), roof drains, curbs, penetrations and other preparatory work performed by other trades.
 2. Structural loading limitations of steel deck and inspect deck for loss of flatness and for required mechanical fastening.
 3. Roofing system requirements (drawings, specifications and other contract documents).
 4. Finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 5. Required inspection, testing, certifying and material usage accounting procedures.
 6. Weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including possibility of temporary roofing.
 7. Record any modifications/deviations from Contract Documents agreed upon and distribute to all parties in attendance at least one (1) week prior to commencement of roofing activities.

1.4 WARRANTY

- A. Furnish to the Owner a full twenty (20) year manufacturer warranty on panel finish system.
- B. Furnish to the Owner a standard two (2) year contractor warranty for all labor and material to include.
1. Perform as designed and installed.
 2. Remain watertight.
 3. Remain free of manufacturer or installation defects.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories, including provisions for expansion and contraction. Show details of weatherproofing, terminations, and penetrations of metal work.
- C. Submit two (2) samples of each type of panel, complete with factory finish.

PART 2 PRODUCT

2.1 MANUFACTURERS

- A. Subject to compliance with these specifications metal roof and soffit panels shall be manufactured by one of the following:
1. MBCI

2. ATAS International
3. Berridge Manufacturing Company

2.2 MATERIALS

- A. General:
 1. Prefinished metal shall be hot-dipped galvanized – ASTM A446-85 Grade C, G90 Coating A525-86 24 Gauge core steel or prefinished Galvalume – ASTM 792-86 AZ-55.
- B. Roof Panels
 1. Basis of Design: “BattenLok HS Panels”, as manufactured by MCB I with 2” inch vertical seem by 16-inch wide panel with striations.
 2. Panel Style: Narrow rib, vertical leg, concealed fastener, positive snap lock standing seam, utilizing male and female rib configuration.
 3. Gauge: 24 gauge (UL 90 rated).
 4. Finish shall be full strength “Kynar 500” or “Hylar 5000” resin fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil.
- C. Soffit and Fascia Panels
 1. Panels shall be factory formed Designer Series 12.0 Flat Panel 12 inch wide
 2. Panel shall have flush profile with flush joints between panels, nested lapped edges, with concealed fasteners.
 3. Finish shall be full strength “Kynar 500” or “Hylar 5000” resin fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil.
- D. Clip: 18 gauge UL-Rated clip to structural substrate as required to meet uplift requirements.
- E. Underlayment
 1. “Deck Guard™ HT” as manufactured by Polyguard Products.
 2. TW Metal and Tile underlayment as manufactured by Tamko.

2.3 ACCESSORY MATERIALS

- A. Fasteners: Galvanized Steel with washers where required.
 1. All fasteners shall be designed to withstand specified design loads.
 2. All exposed fasteners shall be the color of the metal roof system.
 3. Locate and space any exposed fastener in a true vertical and horizontal alignment.
- B. Sealant: As recommended by metal panel manufacturer and in accordance with Section 07 9200, Joint Sealants.

2.4 FABRICATION

- A. All exposed adjacent flashing shall be of the same material and finish as the roof or wall.
- B. Hem all exposed edges of flashing on underside, ½ inch.

- C. Roll form panels in continuous lengths, from eave to ridge, eave to ground, etc. Spliced panels are not acceptable.
- D. Fabricate trim/flushing and accessories to detailed profiles.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine metal deck to ensure proper attachment to framing.
- B. Inspect sheathing to verify deck is clean and smooth, free of depressions, waves or projections and level to ¼" in 20'.
- C. Correct any deficiencies in substrate prior to commencing installation.

3.2 INSTALLATION

- A. Install underlayment in strict accordance with manufacturer's recommendations for location and exposure.
- B. Comply with manufacturers standard instructions and conform to standards set forth in the architectural sheet metal manual published by SMACNA, in order to achieve a watertight installation.
- C. Install starter and edge trim before installing panels.
- D. Remove protective strippable film prior to installation of roof panels. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb. Attach panels using manufacturer's standard slips and fasteners, spaced in accordance with approved shop drawings.
- E. Remove and replace any panels or components that are damaged beyond successful repair.

3.3 CLEANING AND PROTECTION

- A. Clean any grease finger marks or stains from the panels per manufacturer's recommendations. Protect installed panels and trim from damage caused by adjacent construction until completion of installation.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes Sheet Metal Flashing and Trim Work, all underlayments and sealants required for a complete watertight installation as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.). "Architectural Sheet Metal Manual" (current edition)
- B. ANSI/SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

1.3 QUALITY ASSURANCE

- A. Review materials, specifications and details, etc. at the Pre-roofing Conference.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Provide two (2) samples of each prefinished metal for verification of color.
- C. Shop Drawings: Shop Drawings are not required unless specifically called for in the item of Work specified.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Galvanized Sheet Steel:
 - 1. Thickness: Where sheet metal gauges are not noted, use gauges as recommended by SMACNA. In no case shall flashings be less than 24 gauge.
 - 2. Finish: Galvanized or pre-painted galvanized as indicated on the Drawings.
 - a. G-90 (1.25 oz.) galvanized sheet steel conforming to ASTM A653, ASTM A525, or ASTM A361 as required. Paint finish shall comply with AAMA 605.2 "Voluntary Specifications for High Performance Organic Coating on Architectural Extrusions and Panels.
- B. Plastic Cement: A mixture of asphalt and fibers conforming to Federal Specification SS-C-153.
- C. Sealants: One part synthetic rubber sealant.
- D. Reglets: Equal to Fry "Springlok" flashing system type CO, MA, ST, STX, SM as shown. If not indicated on Drawings provide type as required for specific application. Pre-painted

24 gauge galvanized in manufacturer's standard color where indicated or as required to match adjacent metal surfaces.

- E. Underlayment: 30 mil self-adhering reinforced butyl rubber sheet flashing, designed for high temperature and vertical applications. Equal to Grace "Ultra".
- F. Fasteners: Nails, screws, rivets and clips used in connection with galvanized steel work shall be hot dipped galvanized, in sufficient length and configuration to properly anchor the material. Fastenings for dissimilar metals shall be stainless steel. Use 20 gauge minimum galvanized steel for clips, retainers, backer plates, etc.

2.2 FABRICATION

- A. Fabricate sheet metal flashing to shapes and sizes detailed, or required, allowing sufficient material for up-standing leg. Make surfaces free of waves and buckles, with lines and angles sharp and true. No raw, exposed edges shall be permitted.
- B. Prefabricate 18 inches x 18 inches inside and outside corners of flashing and/or counterflashing to be soldered and seamless.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Coordination: Coordinate and cooperate with other trades that affect, connect with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Installation:
 - 1. All sheet metal work, not otherwise detailed, shall conform to applicable details and specifications of SMACNA. Accurately form, fit snugly, have exposed edges folded under at least 1/2 inch with no sharp corners left exposed. Properly shield against galvanic action with asphalt base paint or equivalent. Securely fasten and make absolutely watertight.
 - 2. Attach sheet metal to surfaces that are even, smooth, sound, thoroughly dry and clean, free of defects that might affect application. Materials furnished hereunder to build into Work by others shall be in condition for final installation. Do cutting, fitting, drilling or other operation in sheet metal required to accommodate Work of other Trades.
 - 3. All flashings shall be installed over self-adhering bituminous flashing material. Apply bituminous sheet to all horizontal and vertical surfaces to be flashed lapping over minimum 1 inch at sheet edge. Metal flashing shall extend 1/2 inch below or beyond edge of underlayment.
 - 4. All joints in running flashings and copings shall be butt joined using a cover-plate with backup plate fastened through to the substrate. Allow recommended clearances at butt joint for expansion of the flashing. Install sealant to all facing surfaces prior to final assembly and fastening to substrate.
 - 5. Extend flashings 4 inches beyond jambs of openings. Provide expansion joints at junctions with existing flashings and at straight runs at intervals at 10 foot o.c.

Select type best suited and least obtrusive for condition and make watertight with sealant.

6. Provide items essential to complete the installation, though not specifically shown or specified, of the same kind, quality and type as similar items utilized elsewhere in the building.
7. Lock seam work shall be flat and true to line and be sweated full of solder. Flat lock seams, and lap seams, where soldered, shall be at least 1/2 inch and made in direction of drainage flow. Lap seams, not soldered, according to pitch but in no case less than 3 inches. Thoroughly wash acid flux work after soldering.
8. Wherever possible, secure metal by minimum 1 inch wide cleats, 24 inches o.c. maximum, without nailing through metal. In general, space fasteners not more than 8 inches apart and where exposed to weather use lead washers.
9. Join parts with concealed rivets or sheet metal screws where necessary for strength or stiffness. Place sheets together before drilling. Where lap joints are used, lap sheets at least 4 inches. Provide for expansion of flashings to prevent buckling or warping with slotted fastener holes, slip connections, etc. as recommended by SMACNA.
10. Apply sealant and/or butyl tape to joints, intersections, etc. to provide a watertight connection/joint. Clean concealed surfaces prior to applying sealants,

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 8400

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of Firestopping and smoke-stopping materials and devices for use in fire rated construction.

1.2 REFERENCES

- A. UL Fire Resistance Directory - Through-Penetration Firestop Systems, Joint Systems and Perimeter Fire-Containment Systems
- B. ASTM E814 - Standard Test Method For Fire Tests of Through-Penetration Fire Stops
- C. UL 1479 - Standard for Fire Tests of Penetration Firestops
- D. ASTM E1966 - Standard Test Method For Fire-Resistive Joint Systems
- E. UL 2079 - Standard for Tests For Fire Resistance of Building Joint Systems
- F. ASTM E2307 - Standard Test Method For Determining Fire Resistance of Perimeter Fire Barriers Using the Intermediate-Scale, Multi-story Test Apparatus"
- G. ASTM E2837 - Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies
- H. ASTM E2174 - Standard Practice For On Site Inspection of Installed Fire Stops
- I. ASTM E2393 - Standard Practice For On Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers"
- J. NFPA 101 - Life Safety Code"
- K. NFPA 70 - National Electrical Code

1.3 DESIGN REQUIREMENTS

- A. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps including but not limited to:
 - 1. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.
 - 2. Firestopping at construction gaps between tops of partitions and underside of structural systems or ceiling assemblies.
 - 3. Firestopping of control joints in fire-rated masonry partitions.
 - 4. Firestopping expansion joints.
 - 5. Through-penetration firestop and smoke-stop systems.

- B. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction, and at all separations required to permit building movement and sound or vibration absorption and at other construction gaps as outlined above.

1.4 QUALITY ASSURANCE

- A. Obtain firestop systems for each type of penetration or joint opening and construction condition indicated from a single manufacturer
- B. Applicator shall be experienced in installation or application of systems similar in complexity to those required for this project, plus the following:
 - 1. Applicator shall be trained on installation of through-penetration firestop materials from manufacturer's representative.
- C. Engage an experienced installer who is FM Approved in accordance with FM 4991, Certified by UL as a Qualified Contractor, or otherwise qualified by the firestopping manufacturer as having been trained to install firestop products.
- D. Engage a qualified Special Inspector acceptable to AHJ to ensure systems are properly installed.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Provide data on product characteristics, performance, limitations and documentation of proposed through-penetration firestop systems that reflect actual job conditions.
- C. Shop Drawings: When specifically requested, indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
 - 1. Details of each proposed assembly identifying intended products and applicable Listed System number
 - 2. Manufacturer or manufacturer's representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.
- D. Local and State Regulatory Requirements: Submit forms for acceptance for proposed assemblies not conforming to specific Listed Firestop System numbers, when required by regulatory agencies.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. 3M
- B. Hilti
- C. Isolatek
- D. Passive Fire Protection Partners

- E. Rector Seal
- F. Specified Technologies Inc. (STI)

2.2 FIRESTOPPING OF FIRE-RATED CONSTRUCTION

- A. Through-penetration fire stopping: Systems or devices listed in the UL Fire Resistance Directory under category XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. All materials must meet the requirements and be acceptable to the Owner/facility where the Work is to be installed. Systems or devices must be asbestos-free.
 - 1. Acceptable manufacturers and products:
 - a. Those listed in the UL Fire Resistance directory for the UL System involved.
 - b. Basis of Design Product: The design for Firestopping is based on the product named:
 - 1. Hilti Firestop Systems: www.us.hilti.com.
 - 2. Penetrations through fire-rated floor and roof assemblies that are not contained within a wall cavity shall require a firestop system having equal F and T ratings. Exceptions:
 - a. Floor penetrations by floor, tub or shower drains contained and located within the concealed space of a horizontal assembly do not require a T rating.
 - b. Floor penetrations of maximum 4 inch nominal diameter penetrating directly into metal-enclosed electrical power switchgear do not require a T rating.
- B. Construction-gap (or joint) firestopping: Systems or devices listed in the UL Fire Resistance directory under the category XHBN or XHDG as applicable to the construction type and rating requirements. All materials must meet the requirements and be acceptable to the Owner/facility where the Work is to be installed. Systems or devices must be asbestos free.
 - 1. Acceptable manufacturers and products:
 - a. Those listed in the UL Fire Resistance directory for the UL System involved.
 - b. Basis of Design Product: The design for Firestopping is based on the product named:
 - 1. Hilti Firestop Systems: www.us.hilti.com.
- C. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
- D. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

2.3 SMOKE-STOPPING AT SMOKE PARTITIONS

- A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, provided that the system includes leakage ratings not greater than 5 cfm/sq ft or will provide a smoke seal. All materials must meet the requirements and be acceptable to the Owner/facility where the Work is to be installed. The length of time of the fire resistance may be disregarded.

- B. Construction-gap smoke-stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, is acceptable, provided that the system includes leakage ratings not greater than 5 CFM/ln ft. or will provide a smoke seal. All materials must meet the requirements and be acceptable to the Owner/facility where the Work is to be installed. The length of time of the fire resistance may be disregarded.

2.4 PENETRATIONS AND JOINTS AT SMOKE BARRIERS

- A. Through-penetration systems shall be tested in accordance with UL 1479 and have an L Rating not to exceed 5 cfm/sf of penetration opening or total cumulative leakage not to exceed 50 cfm for any 100 sf of wall or floor area.
- B. Joint firestop systems and perimeter fire barrier firestop systems shall be tested in accordance with UL 2079 and have an L Rating not to exceed 5 cfm per linear foot of joint.

2.5 ACCESSORIES

- A. Fill, void or cavity materials: As classified under category XHHW in the UL Fire Resistance Directory or under Firestop Systems in the Intertek Directory of Building Products.
- B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory or under Firestop Systems in the Intertek Directory of Building Products.
- C. Firestop Devices: As classified under category XHJI in the UL Fire Resistive Directory or under Firestop Systems in the Intertek Directory of Building Products.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Coordinate with work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.2 INSTALLATION

- A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory or Intertek Directory of Building Products and in accordance with manufacturer's instruction.
- B. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.
- C. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested and approved for the application as listed in UL Fire Resistance Directory or the Intertek Directory of Building Products.
- D. In combustible construction, where walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical, 12 inch wide fiber dams for full thickness and height of air cavity at maximum 10 foot intervals, unless shown otherwise on plans.

- E. Keep areas of work accessible until inspection by applicable code authorities, if required.

3.3 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or firestop systems are damaged or removed due to testing, repair or replace systems so they comply with requirements.
- C. Any existing fire-stopping materials that are repaired will be done in a manner acceptable to the Architect/Owner and with materials approved by the Owner and AHJ.
- D. Proceed with enclosing firestop systems with other construction only after inspection reports are issued and installations comply with requirements.

3.4 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 07 9200

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes Joint Sealant work as specified herein. Install caulking, sealants, backing materials, primers and secondary sealants in locations as shown on Drawings and as required for a watertight, weather-tight seal.

1.2 REFERENCES

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.4 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit manufacturer's recommended procedures for application along with manufacturer's standard colors. Provide application information that clearly states the sealant to be used on substrates for all typical applications.
- C. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

PART 2 PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Provide Building Product Disclosure documentation for products used in this section when available.
 - 1. Environmental Product Declarations:
 - 2. Material Ingredients Documentation demonstrating the chemical inventory of the product to at least 0.1% (1000ppm).
- C. Low-emitting requirements – Adhesives and Sealants
 - 1. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
 - 2. VOC Content Requirements for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168.
 - 3. Methylene chloride and perchloroethylene shall not be intentionally added in paints, coatings, adhesives, or sealants.
 - 4. Do not use adhesives that contain urea formaldehyde.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, sealants shall be products of one (or more) of the following manufacturers, subject, however, to compliance with the specification requirements.
 - 1. BASF
 - 2. Dow Corning

3. Pecora
4. Sika
5. Tremco

2.3 MATERIALS

- A. Sealant:
 1. Provide sealants of type as scheduled at the end of this specification. Where application for a particular substrate condition is not listed review with Architect prior to application.
 2. Sealant color shall match the color of the material sealed, unless otherwise noted.
 3. Use "non-sag" types for vertical and overhead work, "self-leveling" for horizontal work.
- B. Back-up materials shall be pre-formed, pre-compressed, self-expanding, cellular foam rod capable of movements of +/- 25% (50% total) of nominal material size and requiring no additional bond break. Back-up materials shall be as recommended by the manufacturer for the substrate and application conditions to be encountered. Materials impregnated with oil, wax, bitumen or similar materials are not acceptable.
 1. Subject to compliance with requirements, provide products by one of the following:
 - a) Backer Rod Manufacturing, Inc.
 - b) Emseal Joint Systems
 - c) Sonneborn
- C. Solvents, cleaning agents and other accessory materials shall be as recommended by sealant manufacturer and shall be non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Coordinate with work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.2 PREPARATION

- A. Only experienced mechanics shall be employed to apply materials under this Section. Clean and prepare surfaces to which sealant is to be applied per manufacturer's recommendations and as specified herein.
- B. Joints to receive sealant shall be a minimum of ¼ inch wide and ¼ inch deep unless otherwise approved.
- C. Thoroughly clean joints, removing foreign matter such as dust, oil, grease, water, surface dirt and frost. Clean porous material such as concrete where necessary by grinding, mechanical abrading, acid washing or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
- D. Clean non-porous surfaces such as metal and glass either mechanically or chemically. Remove protective coatings on metallic surfaces using a solvent that leaves no residue.

3.3 INSTALLATION

- A. Install back-up material or joint filler, of type and size specified, at proper depth in joint to provide a width/depth ratio of approximately 2:1 or as recommended by manufacturer. Do not apply sealant without back-up materials. Do not leave gaps between ends of foam back-up material. Do not stretch, twist, puncture or tear form back-up material.
- B. Prime surfaces where required with primer recommended by sealant manufacturer.
- C. Follow sealant manufacturer's instructions regarding mixing, surface preparation, priming and application procedure.
- D. Apply sealant with sufficient pressure to completely fill joints. Neatly point or tool joint surfaces to provide slightly concave surfaces, free of wrinkles and skips.
- E. Protect adjacent surfaces from excess material. Finish work shall be left in a neat, clean condition.
- F. Protect sealant from contamination by dirt or debris until sealant has fully cured.

3.4 CLEANING

- A. Remove excess sealant material from adjacent surfaces immediately after application. Follow manufacturer's instructions for removal of sealant material from finished surfaces. Restore damaged surfaces to their original condition.
- B. Clean sealant of dust, dirt, stains that may accumulate during the course of construction.
- C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

3.5 SCHEDULES

- A. Installation shall include but not be limited to the following schedule. Provide sealant at locations indicated on the drawings and at all intersections of dissimilar materials. Materials/manufacturers/products listed on schedule are to be considered as the "basis of design". Other products/manufacturers are acceptable provided they are deemed equal to those specified for the application.

TYPE	POLYMER	PRODUCT	USES/APPLICATION
Elastomeric	Silicone	Dow Corning Corporation; 790. Pecora Corporation; 890 NST. Sikasil 290 Tremco Incorporated; Spectrem 1	Control and expansion joints in precast and cast-in-place concrete Exterior joints in vertical surfaces and non-traffic horizontal surfaces Aluminum windows and between doors and windows and other materials
Elastomeric	Two-part Urethane	Pecora Corporation; Dynatrol II BASF Building Systems; Sikaflex 2C Sonolastic NP 2.	Control, expansion, and isolation joints in cast-in-place concrete slabs Joints in exterior horizontal traffic surfaces Joints at building stem or foundation and abutting pavements Threshold bedding

		Tremco Incorporated; Vulkem 227.	
Elastomeric	Silicone or Two-part Urethane	Dow Corning Corporation; 795. Pecora Corporation; 895NST Sikaflex 2C Tremco Incorporated; Spectrem 2 or Spectrem 3	Control and expansion joints in exposed interior surfaces of exterior walls Interior moving joints in vertical surfaces and horizontal non-traffic surfaces Perimeter joints of exterior openings Joints between top of non-load bearing unit masonry walls and underside of cast-in-place concrete slabs & beams Flooring control and expansion joints Frames of interior doors, windows and elevator entrances
Elastomeric	Silicone (mildew resistant)	Pecora Corporation; 898NST Sikasil N Sikasil GP Tremco Incorporated; Tremsil 200	Around fixtures and tile joints at wet areas
Latex caulk	Acrylic Latex	BASF Building Systems; Sonolac. Pecora Corporation; AC-20+. Pecora Corporation; AC-20 FTR Pecora Corporation; AIS 919 Tremco Incorporated; Tremflex 834.	Interior, non-moving joints in drywall and masonry construction
Acoustical	Non-skinning butyl	Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant. Pecora Corporation; AIS-919. USG Corporation; SHEETROCK Acoustical Sealant. Hilti CP605 Tremco, Inc.; Tremco Acoustical Sealant.	Interior acoustical construction

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Hollow Metal Doors and Frames as shown on Drawings and/or as specified herein.

1.2 REFERENCES

- A. ANSI/SDI A250.8 latest edition - Recommended Specifications for Standard Steel Doors and Frames
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors

1.3 QUALITY ASSURANCE

- A. The hardware supplier/installer shall inspect all hollow metal door construction, accuracy of frame, and installation for compliance with the Drawings and Specifications prior to installation of hardware and shall provide written notice to the Architect of any discrepancies noted.
- B. Manufacturer Qualifications: provide all products from a single manufacturer who is a member of the Steel Door Institute the National Association Architectural Metal Manufacturers.
- C. Fire Rated Doors and Frames: Ratings as indicated on Door Schedule, when tested in accordance with NFPA 252, UL 10B or UL 10C.
 - 1. Labeled by UL WH, or other agency acceptable to the authorities having jurisdiction.
 - 2. Stairwell Doors: 250 degrees F (121 degrees C) or 450 degrees F (232 degrees C) temperature rise rating as well as the required fire rating.
- D. Provide fire rated doors that have been tested in accordance with ASTM E152 fire test. Provide each fire door with recognized testing laboratory labels indicating applicable fire rating of steel doors. Install doors to comply with NFPA Standards.
 - 1. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
 - 2. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives.
 - 3. NFPA 101 Life Safety Code, if applicable.
 - 4. Doors and frames shall be labeled and listed by UL.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Schedule: Submit a door/frame schedule reflecting the location frame type, fire rating, wall thickness, hardware set and anchor type.

- C. Shop Drawings: Submit drawings showing elevations of each door type, typical and special details of construction, location and installation requirements for hardware, size and thickness of material.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Doors and their frames shall be furnished by the same manufacturer and shall adhere to the standards of the Steel Door Institute (S.D.I.) or more stringent requirements as indicated herein.
- B. Approved Manufacturers:
 - 1. Amweld
 - 2. Commercial Door & Hardware
 - 3. Curries Company
 - 4. Deansteel
 - 5. Republic Builders Products
 - 6. Security Metal Products Corporation
 - 7. Steelcraft Manufacturing Co.
 - 8. The Ceco Corporation

2.2 MATERIALS

- A. Doors: ANSI/SDI A250.8 Level 3, 16 Ga.
- B. Frames: ANSI/SDI A250.8, 16 ga. steel.
- C. Glazing Beads: Minimum 20 ga. steel.
- D. Exterior frames to be hot-dip galvanized meeting ASTM A525, Grade G60, or electrolytic zinc-coated meeting ASTM A591, Class A.
- E. Paint: Non-lifting, rust-inhibitive grey primer.

2.3 FABRICATION - DOORS

- A. Construct hollow metal doors, seamless edge type, in accordance with ANSI/SDI- A250.8. Reinforce top and bottom of doors horizontally by 14 ga. minimum steel channels, full width, spot welded to each face at least 3 inches on center.
- B. Core construction for interior doors shall be resin impregnated kraft honeycomb core completely filling the inside of the door and laminated to the inside faces of the panels.
- C. Core construction for exterior doors shall be manufacturer's standard polystyrene core.
- D. Provide double doors with one piece astragals of 12 ga. steel, in accordance with NFPA 80 where required for indicated rating.
- E. Accurately mortise doors for locks and hinges. Provide 8 ga. reinforcing for hinges. Provide 14 ga. reinforcement locksets and all other items of hardware.

- F. Lite openings shall be formed into the face sheets so that no glass frame is required. Recess glazing bead behind the formed opening in the face sheet, beveled and attached without screws. Fabricate vision panels to receive double glazing where shown.
- G. All openings in doors for lites, vents, etc. shall be reinforced on all sides with 18 ga. steel channel, spot welded to match door edge reinforcement.
- H. All doors shall be bonderized and primed with one (1) shop coat of factory applied rust inhibitive primer.
- I. Fire-Rated Doors: Provide fire rated doors that have been tested in accordance with ASTM E152 fire test. Provide each fire door with recognized testing laboratory labels indicating applicable fire rating of steel doors. Install doors to comply with NFPA Standards.
 - 1. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
 - 2. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives.
 - 3. NFPA 101 Life Safety Code, if applicable.
 - 4. Doors shall be labeled and listed by UL.
- J. Stiles and rails shall be 16 ga. steel. Stiles shall extend the full height of the door. Rails shall be mechanically joined to the stile forming a neat seam on the face. Top and bottom of the door shall be closed with 14 ga. steel channel welded to the stile and rail minimum 6 inches O.C.

2.4 FABRICATION – DOOR FRAMES

- A. Construct to shapes and sizes shown, meeting various wall thicknesses in accordance with ANSI/SDIA250.8.
- B. Fabricate frames with mitered corners and full profile welded, filled, and ground smooth.
- C. Mortise, reinforce, drill and tap for standard weight, full mortise template hinges and template strike. Provide countersunk screw hole at bottom of each jamb face for anchorage into rough opening and patented compression lug assembly to close and lock corner miters.
- D. Provide not less than three (3) 16 ga. anchors per jamb up to 7 feet-6 inches in height. Add one anchor per jamb per each 30 inches of frame height or fraction thereof. Provide adjustable 12 ga. min. welded floor clips at each jamb.
- E. Make cutouts for required hardware from templates furnished by hardware vendor. Reinforce hinge jambs with minimum 10 ga. steel plate drilled and tapped and welded in place. Reinforce head as recommended by closer manufacturer.
- F. Provide strike stops of frames with holes for three rubber door silencers; on double door frames, provide for two silencers at head.
- G. For openings over 42 inches wide and at double openings, reinforce head members full width with a minimum 3 inches wide channel of 12 ga. steel.
- H. Frames for UL labeled doors shall be constructed in accordance with UL requirements and shall be labeled as scheduled.
- I. Where butt hinges are to be utilized for mounting of the door comply as follows:
 - 1. Butt Hinge Length

Thickness of door	Width of door	Height of Butt Hinges
-------------------	---------------	-----------------------

- | | | |
|--------------|----------------------|------------|
| 1 ¾ in. door | to 36 in. | 4 ½ in. |
| 1 ¾ in. door | over 36 in to 48 in. | 5 in. |
| 1 ¾ in. door | over 48 in. | Continuous |
2. Number of Butt Hinges required.
 - a. Doors 60 inches high and under: 2 butt hinges
 - b. Doors over 60 inches high and not over 90 inches high: 3 butt hinges
 - c. Door over 90 inches high and not over 120 inches high: 4 butt hinges
 - J. Stops on interior door frames, except fire doors, shall terminate 6 inches above finish floor cut at 45 degrees and closed.
 - K. Provide plaster guards at back of hinge and strike cutouts at frames to be grouted.

2.5 FABRICATION - GLAZING FRAMES

- A. Construct in accordance with applicable parts of door frame specification above and as detailed. Carry partition frames around all four sides of openings.
- B. Provide glazing stops, removable from the exterior side and integral on the interior side, secured with countersunk flat head Phillips screws spaced at not more than 16 inches on center and 2 inches from corners. Miter corners of stops and set with hairline joints.
- C. Fabricate exterior frames to accept 1 inch insulating glazing units unless noted otherwise. Fabricate interior frames to accept 1/4 inch glazing unless noted otherwise.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Frames:
 1. Install all metal door frames, except those specified in other Sections for special types of doors. Install frames plumb, level and rigidly secure in place. Properly brace until built in.
 2. Backs of frames to any masonry or concrete shall be filled solid with mortar.
 - a. When cold temperature conditions necessitate an additive to be used in the mortar, the contractor installing the frames shall coat the inside of the frames with a corrosion inhibiting bituminous material.
 3. Where frames are not available to be anchored into the surrounding masonry during construction, or where a new frame is to be installed in an existing masonry wall, frames shall be "punched and dimpled" to allow anchorage through the frame. Type, number, location, and installation of anchors and frame shall be in strict accordance with manufacturer's printed data sheets. After anchorage, frames are to be solid grouted through ports at frame head.
- B. Doors:
 1. Install doors plumb and in true alignment in a prepared opening and fasten them to achieve the maximum operational effectiveness and appearance.
 2. Maintain proper door clearance in accordance with SDI-110.
 3. Hinge shims, if required, shall be metallic.

3.2 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 08 1416

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication, finish and installation of rated and non-rated Wood Doors as shown on Drawings, schedules and as specified.

1.2 REFERENCES

- A. Standards: Flush Wood doors shall be manufactured to meet or exceed the following standards for type of door specified.
 - 1. Window and Door Manufacturers Association (WDMA), Industry Standards for "Architectural Wood Flush Doors".
 - 2. Architectural Woodwork Institute (AWI).
 - 3. ANSI A208.1

1.3 QUALITY ASSURANCE

- A. Coordination: Contractor shall be responsible for coordinating and obtaining necessary information from hardware and metal frame manufacturers. Door manufacturer shall be responsible for coordinating necessary information received by Contractor from hardware and metal frame manufacturers in order that doors shall be properly prepared to receive hinges and hardware.
- B. Regulatory Agencies: Wood Fire Doors shall be listed and labeled by a nationally recognized testing and certification agency, in accordance with applicable building codes. The listed doors shall meet or exceed ASTM E152 (Methods of Fire Test of Door Assemblies), UL-10 (b) (Positive Pressure Fire Test of Door Assemblies), or NFPA 252 (Standard Methods of Tests of Fire Door Assemblies).
 - 1. Intertek Testing Services-Warnock-Hersey International (ITS-WHI), or Underwriters Laboratories (UL), for fire labels.
- C. Certification: Provide all flush wood doors from a single manufacturer. Doors shall be marked and certified as follows:
 - 1. Each fire rated and sound rated door to be fitted with a label permanently attached at eye level, to the hinge stile (If continuous hinges used label may be placed on top of edge of door), indicating the testing agency's approval for the rating required.

1.4 WARRANTY

- A. Special Warranty: The following warranty shall be submitted to the Owner in addition to the Warranty described in Section 01 7700, Closeout Procedures.
 - 1. Warrant doors from the date of installation against defects in materials and workmanship, including the following:
 - a. Delamination in any degree.
 - b. Warp or twist of 1/4-inch or more in any 3-foot 6-inch x 7 foot section of a door.
 - c. Telegraphing of any part or core assembly through face to cause surface variation of 1/100 inch or more in a 3-inch span.

- d. Any defect which may, in any way, impair or affect performance of the door in the purpose for which it is intended. Replacement under this warranty shall include removal of the defective door, hanging, installation of hardware, and finishing.
- 2. Periods of warranty after date of installation:
 - a. Interior solid core and mineral core: Life of installation.
 - b. Exterior solid core door: Five (5) years

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Shop Drawings: Submit drawings showing door sizes and types, door details and elevations. Note any discrepancies between the Drawings and door schedules and the requirements of regulatory and /or testing agencies.
- C. Product Data: Submit manufacturer's data showing door construction.
- D. Samples: Before fabrication, submit sample of each type of door to be furnished, showing face, edge, core construction and factory finish for each type specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Doors shall be products of one of the following manufacturers:
 - 1. Eggers Industries
 - 2. Graham Mfg. Co.
 - 3. Lambton Doors
 - 4. The Maiman Company
 - 5. Masonite international
 - 6. Oregon Door
 - 7. Vancouver Architectural Doors
 - 8. V.T. Industries

2.2 MATERIALS

- A. Manufactured Wood Products: shall conform to the requirements of this section and be free from urea-formaldehyde binding components and consist of a minimum of 40% post-industrial recycled content.
- B. Face Veneers: Shall conform to the requirements of this section and be free from urea-formaldehyde binding components.

2.3 FLUSH DOORS

- A. Cores:
 - 1. Particleboard Core - (Interior Solid Core): Shall conform to LD-2 Standard.
 - a. Doors with closers shall include 6-inch solid wood top rail. 6-inch wide solid wood bottom rails are required for manual and automatic flush bolts and automatic door bottoms.
- B. Edge Bandings:
 - 1. Stiles (Dimensions given are minimum sizes allowed after factory trimming

- a. Particleboard Core: as indicated above.
 - b. Mineral Core: Manufacturer's standard for receiving a full mortise hinge.
- 2. Rails (Dimensions given are minimum sizes allowed after factory trimming.)
 - a. Wood Core: 1 1/4-inch minimum mill option hardwood rail or 1-1/8 inch laminated strand lumber (LSL).
 - b. Mineral Core: Manufacturer's standard rail shall be used to accomplish label required.
- C. Plastic Laminates: When plastic laminate is used as a face, door shall comply with WDMA HPDL-5 standard. Laminate shall be .050 standard grade to be selected from manufacturers available sources. Stile edges and outer wood trim shall be mill option hardwood with matching plastic laminate.
- D. Adhesives shall not contain urea formaldehyde.

2.4 LABELED (FIRE RATED) FLUSH DOORS

- A. Mineral core flush veneered doors shall be 5-ply made up of face veneers, crossbanding, and a core unit all securely bonded together.
- B. Face Veneers: Same as previously specified.
- C. Crossbanding: Same as previously specified.
- D. Core Unit: Manufacturer's noncombustible mineral, monolithic particleboard, or in wood sections tightly fitted and glued.
- E. Stiles and Rails: Manufacturer's standard to comply with the fire rating requirements. Factory seal end rails.
- F. Vision frames and lites: with 1/4-inch glazing meeting all code requirements.
- G. Labeled doors shall be manufactured to the required size so as to provide proper clearances without field trimming. All machining of labeled doors must be completed before label is applied. This procedure shall be followed so as to assure the full thickness of the edge bands. Fire doors must be machined to meet NFPA pamphlet 80 requirements.
- H. Meeting edges on pairs of labeled doors:
 - 1. Fire-treated stiles at pairs of 20-minute doors.
 - 2. Metal edge and astragal at pairs of 45, 60- and 90-minute doors with concealed vertical rods.
 - 3. Other location as required to maintain rating of opening.

2.5 VISION FRAMES AND LITES

- A. Metal frames shall be UL, or ITS-WHI approved formed of 0.048-inch- (1.2-mm) thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish.
- B. Manufacturer's standard wood bead profile in matching wood species. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- C. Provide 1/4-inch glazing meeting all code requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine door frames to assure that jambs are true and plumb. Frames that are not true, square and plumb shall be corrected before doors are hung.

3.2 INSTALLATION

- A. Doors shall be hung true and plumb with standard bevel and with uniform 3/32-inch clearance at jambs and head, and 1/2-inch bottom clearance 1/4-inch at isolation and similar (negative pressure) rooms unless otherwise required.
- B. Doors shall not be cut or planed for fitting. Wood doors installed on the Project shall operate freely without sticking or binding, and with hardware properly adjusted and functioning.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 08 3116

ACCESS PANELS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Access Panels and Frames as shown on drawings and/or as specified herein.

1.2 SUBMITTALS

- A. Submittal requirements are specified Section 01 3300, Submittal Procedures.
- B. Shop Drawings: Submit drawings showing sizes, construction and installation details.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, Access Doors shall be products of one of the following manufacturers, subject to compliance with Specifications and Drawing requirements.
 - 1. J.L. Industries
 - 2. Milcor
 - 3. Nystrom

2.2 MATERIALS

- A. Units shall be in types as required by wall or ceiling construction. Size as required for access and/or inspection.
- B. 16-gauge stainless steel shall be used for units within restrooms, kitchens or other similar areas or subject to moisture.
- C. 16-gauge prime painted steel shall be used for door and frame at other locations.
- D. Doors shall be provided with key operated cylinder lock.
- E. Fire Rating: Doors shall be UL or Warnock Hersey labeled and meet self-closing and self-latching requirements for the rated assemblies where they occur.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Coordinate with other work that affects, connects with, or will be concealed by this Work.
- B. Provide access doors at locations as required by building codes, manufacturer's requirements for equipment access, and/or as indicated.

3.2 INSTALLATION

- A. Install access doors in accordance with manufacturer's directions for each type.
- B. Install plumb and level, true to line.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 08 3323

OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Overhead Coiling Doors as shown on drawings and as specified herein.

1.2 REFERENCES

- A. ASTM E152 - Methods of Fire Tests of Door Assemblies
- B. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

1.3 QUALITY ASSURANCE

- A. Provide each upward coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.
 - 1. Provide upward coiling door units by one manufacturer for entire Project.
- B. Wind loading: Unless otherwise noted, design and reinforce upward coiling doors to withstand a 20 psf 985 mph) wind loading pressure.
- C. Fire doors shall be fabricated and installed in accordance with:
 - 1. Underwriters' Laboratories.
 - a. Provide each door with a metal UL label as evidence of rating, with label indicating rating in hours of duration of exposure to fire, and a letter designation of location for which the assembly is designed.
 - 2. National Fire Protection Association (NFPA) 80.
- D. Installation shall be by an authorized door manufacturer's authorized representative.
- E. Air leakage and U-factor:
 - 1. Provide a permanent name-plate, installed by the manufacturer, listing the U-factor, SHGC and air leakage rate.
 - 2. U-factor and the air leakage rate for all doors installed between conditioned space, semi-heated space, unconditioned space, and exterior space shall be identified on a permanent nameplate installed on the product by the manufacturer.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Shop Drawings: Submit Shop Drawings showing elevations of each door type, typical and special details of construction, and operating devices, location and installation requirements for hardware, size and thickness of materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, coiling overhead doors for this Project shall be furnished by the following:
 - 1. Clopay Building Products
 - 2. Cornell Cookson
 - 3. Overhead Door Company

2.2 OVERHEAD COILING DOORS:

- A. Overhead doors shall be crank operated manual service door, in sizes as shown on the Drawings equal to Model 610 by Overhead Door Company. Doors shall be counterbalanced so as to require a minimum lifting force.
- B. Curtain shall consist of contoured slats, endlocks, windlocks as required and bottom bar with compressible vinyl astragal extending full width. Slat shall be 22 gauge roll-formed steel formed and corrugated to provide proper curtain stiffness against wind pressure, have a hot dipped galvanized coating 1.25 oz. per sq. ft. of flat metal and be phosphatized for paint adhesion prior to forming, in accordance with ASTM A525. No portion of the slat shall have a reduction in forming to exceed 10% of the initial thickness of the material. The bottom of the curtain shall have two steel reinforcing angles of 1/8 inch minimum thickness.
- C. Brackets shall be of steel plate mounted on a steel angle acting as a single structural element with the guide wall angle and have a stiffening steel rib around its contour to act also as an end support for the hood. Brackets and guides shall be mounted flush on the inside.
- D. Hood shall be of 24-gauge minimum hot dipped galvanized sheet metal having stiffening beads or flanges and mounted on the brackets. Hoods 18 feet wide and over shall be equipped with an intermediate support.
- E. Guides shall be 3/16-inch minimum thick steel angles or cold roll-formed sections. Guide construction and dimensions shall be as shown on Drawings or as required by manufacturer's requirements.
- F. Pipe curtain carrier shall be steel and supported by grease packed ball bearings or self-lubricating graphite bearings and house the counterbalancing spring assembly. Pipe deflection under full load shall not exceed .03-inch per lineal foot.
- G. Spring assembly shall consist of counterbalancing oil tempered steel helical torsion springs, cast iron spring holding anchors, steel torsion rod and cast iron spring adjusting wheel.
- H. Shop painting shall consist of one factory applied coat of rust-inhibitive metal primer on non-galvanized exposed surfaces except working parts of machinery and baked-on prime coat on curtain and hood.
- I. Locking Device: Provide 5-pin, 1-1/8-inch rim cylinder lock operable from inside or outside door with die cast plate retainer. Coordinate and locate locks and latches to be readily accessible from inside, avoiding fixed objects, mullions, walls, glass, etc. unless otherwise indicated. Coordinate cylinder to be compatible with building lock system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Overhead doors shall be installed in accordance with manufacturer's instructions and standards accurately and complete with hardware. Parts and equipment shall be kept free from scratches, dents or other defacements. Overhead doors installed on the project shall operate freely, without sticking or binding and with hardware properly adjusted and functioning.

3.2 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 08 4100

ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of exterior and interior Aluminum Framed Entrances and Storefront systems (including doors where applicable) as indicated and specified.

1.2 REFERENCES

- A. ASTM B633 - Specification for steel fasteners coated with zinc coating.
- B. ASTM B221 - Specification for Aluminum Alloy Extruded Bar, Rod, Wire, Shape and Tube.
- C. ASTM E283 - Test method for Rate of Air Leakage through exterior windows, curtain walls and doors.
- D. ASTM E330 - Test method for Structural Performance of exterior windows, curtain walls, and doors by Uniform Static Air Pressure Difference.
- E. ASTM B136 - Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
- F. ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- G. ASTM B244 - Measuring thickness of anodic coatings on aluminum with Eddy-current instruments.
- H. ASTM B 137 - Standard method for measurement of weight of coating of anodized coated aluminum.
- I. ASTM A36 - Standard Specification for Carbon Structural Steel.
- J. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- K. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- L. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- M. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.

- O. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Wall, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- P. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.
- Q. AAMA 2605.2 - Voluntary Specification Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels.
- R. AAMA TIR-A11 - Maximum Allowable Deflection of Framing Systems for Building Cladding Components at Design Wind Loads.
- S. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Wall and Sloped Glazing Systems.
- T. AAMA 507 - Standard Practice for Determining the Thermal Performance Characteristics of Fenestration Systems Installed in Commercial Buildings.
- U. AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance of Windows, Doors and Glazed Wall Sections.
- V. NFRC 100 - Procedures for Determining Fenestration Product U-factor, Section 5.6 – Non-Residential Products.
- W. NFRC 200 - Procedures for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittances at Normal Incidence.
- X. NFRC 500 - Procedure for Determining the Condensation Resistance of Fenestration Products.

1.3 DESIGN REQUIREMENTS

- A. Design Criteria:
 - 1. Glass framing members shall provide for flush glazing and no projecting stops. The system shall provide fully resilient settings for glass and panels by use of elastomeric gaskets on both sides of the glass. When required, adapters and mountings for operating windows, trim moldings and face materials shall be designed so as to permit the installation of these products in their regular manner and shall not interfere with the normal assembly and weathering of the grid framing.
 - 2. System shall be designed for *interior* or *exterior* glazing with provisions for collecting and diverting water infiltration from the interior of the system. Sizes, spacing's of members, profiles and dimensional requirements of entrance and storefront work as indicated here or in drawings.
 - 3. System design is to allow for most effective installation and performance utilizing one, or a combination of, the following methods of construction:
 - a. Screw spline construction (flush appearance).
 - b. Shear block construction (flush appearance).
 - c. Stacking system with continuous head and sill can, (projection at head and sill).
 - 4. Minor deviations will be accepted at the discretion of the Architect in order to utilize manufactures standard products when, such deviations do not detract from the design concept or intended performances.

- B. Performance Requirements: provide aluminum entrance and storefront assemblies that comply with specified performance characteristics. Each assembly shall be tested by a recognized testing laboratory or agency in accordance with specified test methods.
1. Environmental Requirements:
 - a. Air Infiltration: The systems shall be designed to perform in accordance with ASTM E283. Infiltration shall not exceed 0.06 cfm per square foot fixed area.
 - b. Water Infiltration: The system shall be designed to perform in accordance with ASTM E331. No water penetration at a test pressure of 8 psf.
 2. Water Resistance Test of Installed Assembly in Field:
 - a. Test: AAMA 503 and ASTM E1105. Static pressure of 6.24psf.
 - b. Field test a minimum of one percent of installed fenestration products. Perform tests at full specified test pressure of 6.24 psf. (Do not allow one-third deduction from test pressure, per AAMA 503 paragraph 4.9. »
 3. Uniform Load Structural Deflection Test:
 - a. Test: ASTM E330 test unit at positive and negative static air pressure difference conforming to 1.5 times design pressure difference at 10 seconds, conforming to IBC Section 1605 as defined by Structural Notes.
 - b. Load Deflection Under Design Load: Do not exceed L/175 of glass edge length or 3/4 inch whichever is less, under design loads when subjected to larger of combined positive or negative design loads, conforming to IBC Section 2403.
 - c. Test Conclusion: No glass breakage, permanent damage to fasteners, nor other damage that would cause the storefront to be defective.
 4. Condensation Resistance Test (CRF): Thermal Frame Only
 - a. Test: AAMA 1503.1
 - b. Condensation Resistance Factor (CRF): Not less than 59.
 5. Thermal Transmittance Test: Thermal Frame Only
 - a. Meet or exceed the applicable Energy Codes and provisions of the Contract Documents.
 6. Structural Requirements:
 - a. Wind load: Based on a wind load of 25 psf, or established building design load, inward and outward, the maximum mullion spacing shall not provide a deflection greater than L/175 of the total span when tested in accordance with ASTM E330.
 - b. Dead Loads: The system shall not deflect more than 1/8" at the center point of a horizontal member nor more than 1/16 inch for the door header for the following glazing thicknesses.
 - 1.) 3.25 psf for 1/4 inch glass
 - 2.) 6.5 psf for 1 inch insulating glazing units
 - c. Thermal Movement: Systems shall be designed and installed to provide for thermal expansion and contraction within the system components caused by a maximum 170 degree cycling temperature without causing detrimental effects to system or components.

1.4 MOCK UP

- A. Provide (as a portion of a larger wall system mockup) a section of the framing/glazing system for review and approval.
1. Construct mock-up to allow evaluation of sill flashing pan, rough opening flashing, storefront anchors, and sealant application.
 2. Mock-up shall be reviewed and approved by Architect and Owner prior to the start of further storefront installation.

3. The approved mock-up shall be used as the quality standard by which subsequent work will be based.

1.5 PREINSTALLATION MEETING

- A. Coordinate pre-installation meeting to include the Architect, Owner, Contractor, Installer, Manufacturer's Representative, exterior cladding contractors and other parties whose work adjoins or integrates with the storefront system.
 1. Convene minimum 2 weeks before beginning work of this Section.
 2. Review mock-up of storefront system rough opening flashing, and installation of storefront system assembly.
 3. Review all proposed details and submittals information to verify compliance for proposed system with project requirements.
 4. Review actual jobsite conditions, details, substrates, etc. for conformance with glazing system requirements.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer and installer shall have minimum of five (5) years successful experience in and around the project location for the fabrication and assembly of Work specified herein.
- B. Single Source Responsibility: Provide work of the following sections as one complete unit of work and as products of single manufacturer.
- C. Manufacturer's Representative to perform periodic field inspections of the specified product being installed and provide written reports at intervals during installation but no less than one "in-progress" report and one "final" report.
- D. Manufacturer's representative shall receive and review all submittals, shop drawings, product information and will promptly notify contractor of any deficiencies found therein.

1.7 WARRANTY

- A. Provide a written warranty executed by the Contractor, Installer and Manufacturer agreeing to repair or replace units that fail in materials or workmanship within the following specified warranty periods.
 1. The framing system, materials, shall be warranted against deterioration of metals due to manufacturing process and fabrication for a period of two (2) years.
 2. The framing system, fabrication and design, shall be warranted against structural failures, including excessive deflection, excessive leakage, and air infiltration due to manufacturing process and fabrication for a period of two (2) years.
 3. The anodized exterior finish system shall be warranted against color fading, chipping, and delamination for a period of five (5) years.

1.8 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
 1. Submit manufacturer's product specifications, technical product data, standard details, and installation recommendations for each type of entrance and storefront product required.
 2. Submit Shop Drawings for fabrication and installation of entrances and storefronts, including the following:
 - a. Elevations

- b. Detail section of typical composite members
 - c. Hardware, mounting heights
 - d. Anchorages and reinforcements
 - e. Expansion provisions
 - f. Glazing details
- 3. Submit pairs of samples of each type and color of aluminum finish on minimum 3 inch x 4 inch material. Where color or texture variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of variations.
 - 4. Provide performance test results showing that entrance storefront systems have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Exterior and Interior Storefront: Basis of Design: Subject to compliance with requirements, provide Kawneer Company, Inc. Framing System or comparable product by the following:
 - 1. Oldcastle Building Envelope/Vistawall
 - 2. YKK AP

2.2 MATERIALS

- A. The following series designations reference systems by Arcadia, Inc. Equal systems by approved manufacturers are acceptable.
- B. Exterior (Thermally Broken) Offset Glazed Framing System:
 - 1. Aluminum entrances and storefronts framing shall be offset glazed for 1" glazing as follows.
 - a. Trifab VersaGlaze 451T- 2" x 4 ½" for 1" Glass
- C. Extruded framing members shall be A-6063-T6 alloy and temper aluminum complying with ASTM B221 alloy G.S. 104-55 having a minimum wall thickness of .080.
- D. Provide fasteners for assembling the framing systems of aluminum, stainless steel, and other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components.
 - 1. Steel fasteners used in the assembly of the framing system shall be coated with a zinc coating complying with ASTM B633.
- E. Perimeter anchors shall be aluminum or steel of the suitable size and design to resist applied loading on the framing system:
 - 1. Steel fasteners used in the assembly of the framing system shall be coated with a zinc coating complying with ASTM B633.
- F. Glazing gaskets at shall be manufacturer's standard for system specified.
- G. Glass shall be as specified in Section 08 8100, Glass Glazing, and installed as specified herein.
- H. Accessories to the framing system shall include the following:

1. End dams, sub sill flashing and other water diverters necessary to provide proper internal weepage of the system.
 2. Minimum 0.060 inch aluminum brake metal flashings and trims, finished to match framing system. Use 0.090 inch aluminum brake metal where required to control "oil canning" for profiles greater than 12" in any dimension.
- I. Sealant as recommended by system manufacturer.

2.3 DOORS

- A. The following series designations reference systems by Arcadia, Inc. Equal systems by approved manufacturers are acceptable.
- B. Doors: Manufacturer's standard glazed doors, for manual swing operation.
1. Door Construction 1 3/4" – 2 1/4" overall thickness, with a minimum of 0.125 inch thick, extruded-aluminum tubular rail and stile members. Mechanically fastened and welded corners.
 2. Door Design: 500 Heavy Wall Wide Stile Entrances.
- C. Flush Panel Doors: Manufacturers standard reinforced flush panel entrance door for manual swing operation.
1. Door Construction 1 3/4" overall thickness, with a minimum of .090 inch thick sheet. .125 rails joined to stiles by 3/8" steel rods, receive and conceal cut edges of face sheets.
 2. Door Design: RP 325 Series
- D. Hardware:
1. All integrated electric and non electric hardware for immediate entrance doors and frames specified under "Finish Hardware" of the specifications shall be furnished and installed by the door and frame manufacturer.

2.4 SYSTEM FABRICATION

- A. Framing system shall be securely joined together with accurately fit joints and corners providing for a sealed, weather-tight system.
- B. Continuous sub-sill flashing shall be provided under sill members to collect water infiltration and divert water from the interior of the system. Sub-sill flashing shall be fastened mechanically at end dam and sealed per manufacturer's recommendations.
- C. Sill shall provide for exterior weepage at sill flashing or weep holes located approximately 6" each side of jamb and vertical mullions. Minimum 5/16" diameter hole.
- D. Framing system shall be designed with provisions for collecting and diverting water infiltration from the interior of the system and shall provide for flush glazing on all sides with no projecting stops.
- E. Framing members adjacent to entrances shall be provided by the same manufacturer as the framing system and be compatible with the framing system.
- F. Framing members shall be internally reinforced as required galvanized steel channel shapes as necessary for performance requirements, for hardware attachment and as indicated.

- G. Fasteners, attachments, and jointing shall be so located as to ensure concealment from view in the final assembly. Exposed fasteners shall be finished to match framing system.
- H. Maintain accurate relationship of planes and angles, with hairline fit contacting members.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation. Installation shall be completed only by qualified personnel, experienced in this type of Work.
- B. Set units plumb, level, and true to line, without warping or racking of framing members. Provide proper support and anchor securely in place. Comply with the recommended installation requirements for "thermal expansion" in accordance with the framing system manufacturers printed instructions.
 - 1. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials. Comply with requirements specified under paragraph "Dissimilar Materials" in the Appendix to American Architectural Manufacturers Association 101.
 - 2. Head members for butt hinges and offset hung door installations shall be "solid, one-piece tubular" extruded members only.
 - 3. Drill and tap framing members as required for the installation of doors and apply surface-mounted hardware items.
 - 4. Sill members shall be set in full bed of sealant, or with joint fillers or gaskets to provide weather-tight construction. Install flashings and end dams in strict compliance with manufacturer's details.

3.2 CLEANING

- A. Clean material after installation. No abrasive, cleaning agents shall be used. Material damaged shall be replaced before final acceptance will be made.
- B. During the course of the Work and on completion of the work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Sound Control Hollow Metal Door Assemblies".
 - 4. Division 08 Section "Sound Control Wood Door Assemblies".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight

package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten (10) years for extra heavy duty cylindrical (bored) locks and latches.
 - 2. Five (5) years for exit hardware.
 - 3. Twenty five (25) years for manual overhead door closer bodies.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 - 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 - 5. Manufacturers:
 - a. Bommer Industries (BO).
 - b. Ives: Allegion (IVE).
 - c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Ives; Allegion (IVE).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 1. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Ives; Allegion (IVE).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 5. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Ives; Allegion (IVE).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

- C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 4. Keyway: Match Facility Standard.

- D. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Three (3).
 2. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide construction master keyed cylinders.
- G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.13, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.
1. Locks are to be non-handed and fully field reversible.
 2. Manufacturers:
 - a. Schlage; Allegion (SCH) – ND Series ATH trim with large format removable cores to match Owner's system..
 - b. No Substitution.

2.6 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
1. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 2. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 3. Dustproof Strikes: BHMA A156.16.

2.7 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices: ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature. Use QEL feature where card readers are specified.
1. Manufacturers:
 - a. Von Duprin; Allegion (VON) – 33A/99 Series.
 - b. No Substitution

2.8 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be

rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:
 - a. LCN; Allegion (LCN) – 4040XP Series.
 - b. No Substitution.

2.9 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Ives; Allegion (IVE).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Ives; Allegion (IVE).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Glynn Johnson; Allegion (GLY).

- b. Rixson Door Controls (RF).
- c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- d. Sargent Manufacturing (SA).

2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 - 2. Reese Enterprises, Inc. (RE).
 - 3. Zero International; Allegion (ZER).

2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures” and “Cash Allowances”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
 - 2. Submit documentation of incomplete items in the following formats:
 - a. PDF electronic file.
 - b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. ALTERNATE #3: Include the cost of hardware for door 121 – Hardware Set D205

C. Manufacturer's Abbreviations:

1. IVE - Ives
2. SCH - Schlage
3. VON – Von Duprin
4. LCN - LCN
5. GLY – Glynn Johnson
6. ZER – Zero International

Hardware Group No. 103

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRY LOCK	ND53TD ATH	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 201

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD ATH	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 203

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD ATH	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 303S

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S ATH	626	SCH
1	EA	OH STOP	900S SERIES X SIZE & MOUNTING AS REQ	630	GLY
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 501

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD ATH	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

Hardware Group No. 700MR

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954 HEIGHT AS REQ	689	VON
2	EA	FIRE EXIT HARDWARE	99-L-F-06-SNB LENGTH AS REQ	626	VON
3	EA	FSIC CORE	23-030	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 W/KEYED CONST. CORE COORDINATE CAM WITH LOCK	626	SCH
2	EA	FSIC RIM CYLINDER	20-057 W/KEYED CONST. CORE	626	SCH
2	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)	✓ LGR	SCE

Hardware Group No. 801

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4040XP RW/PA X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. C714AM

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY EPT HEIGHT AS REQ	628	IVE
2	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
1	EA	REMOVABLE MULLION	KR4954 HEIGHT AS REQ	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-33A-EO-CON LENGTH AS REQ	✓ 626	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-33A-NL-OP-CON LENGTH AS REQ	✓ 626	VON
2	EA	FSIC CORE	23-030	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 W/KEYED CONST. CORE COORDINATE CAM WITH LOCK	626	SCH
1	EA	FSIC RIM CYLINDER	20-057 W/KEYED CONST. CORE	626	SCH
2	EA	90 DEG OFFSET PULL	8190-O 10"	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	SEAL	PERIMETER SEAL BY FRAME MFR.		
1	SET	ASTRAGAL	MEETING STILE SEAL BY DOOR MFR.		
2	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
4	EA	HARNESS (1 IN DOOR & 1 IN FRAME)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
2	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	CREDENTIAL READER BY ANOTHER SECTION		
2	EA	DOOR CONTACT	679-05 TYPE AS REQ	✓ WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR CREDENTIAL READER BY ANOTHER SECTION		
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)	✓	VON

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
 -FREE EGRESS BY THE PUSH PADS.

Hardware Group No. C715

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-99-NL-CON-SNB LENGTH AS REQ	✓ 626	VON
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FSIC RIM CYLINDER	20-057 W/KEYED CONST. CORE	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	HARNESS (1 IN DOOR & 1 IN FRAME)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	CREDENTIAL READER BY ANOTHER SECTION		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	✓ WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR CREDENTIAL READER BY ANOTHER SECTION		
1	EA	POWER SUPPLY	PS902 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)	✓ LGR	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.
 -FREE EGRESS BY THE PUSH PAD.

Hardware Group No. CE201

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD ATH	626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	ELECTRIC STRIKE (SGL DOOR - HMF)	6211-FSE-CON (FAIL SECURE) VOLTAGE AS REQ	✓ 630	VON
1	EA	SURFACE CLOSER	4040XP RW/PA TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER
1	EA	HARNESS (TO POWER SUPPLY)	CON-6W - CONNECTION LEADS		SCH
1	EA	CREDENTIAL READER	CREDENTIAL READER BY ANOTHER SECTION		
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	✓ WHT	SCE
1	EA	MOTION SENSOR	SCANII 12/24 VDC	✓ WHT	SCE
1	EA	POWER SUPPLY	POWER SUPPLY FOR CREDENTIAL READER BY ANOTHER SECTION		
1	EA	POWER SUPPLY	PS902 FA900 120/240 VAC (COORDINATE PS WITH SECURITY CONTRACTOR PRIOR TO SUBMITTALS)	✓ LGR	SCE

-Ingress by the card reader or key override.

-Egress by the lever.

-At fire rated doors, wire the electric strike to the fire alarm system.

-At fire rated doors, the electric strike will become fail secure upon activation of the fire alarm system.

Hardware Group No. D001

Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FSIC MORTISE CYLINDER	20-061 W/KEYED CONST. CORE COORDINATE CAM WITH LOCK (COORDINATE TYPE & TAILPIECE W/DOOR MFR.)	626	SCH
1	EA	DOOR CONTACT	674-OH	✓ 628	SCE
1			BALANCE OF HARDWARE BY DOOR MANUFACTURER		

Hardware Group No. D205

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
1	EA	STOREROOM LOCK	ND80TD ATH RX CON	✓ 626	SCH
1	EA	FSIC CORE	23-030	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
1	EA	HARNESS (1 IN DOOR & 1 IN FRAME)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	✓ WHT	SCE

Hardware Group No. D715

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
1	EA	ELEC PANIC HARDWARE	RX-99-NL-CON-SNB	✓ 626	VON
1	EA	FSIC CORE	23-030	626	SCH
1	EA	FSIC RIM CYLINDER	20-057 W/KEYED CONST. CORE	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH TBWMS X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142A DW + 4"	AA	ZER
1	EA	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA LENGTH AS REQ	AA	ZER
1	EA	THRESHOLD	65A LENGTH AS REQ	A	ZER
2	EA	HARNESS (1 IN DOOR & 1 IN FRAME)	ALLEGION CONNECT TYPE & LENGTH AS REQ		SCH
1	EA	DOOR CONTACT	679-05 TYPE AS REQ	✓ WHT	SCE

-INGRESS BY THE CARD READER OR KEY OVERRIDE.

-FREE EGRESS BY THE PUSH PAD.

END OF SECTION

MIDLOTHIAN ISD STADIUM ADDITIONS AND RENOVATIONS
DOOR INDEX

Door Numbers	HwSet#
100	C714AM
101	103
102	103
103	103
104	103
105	201
106A	501
106B	501
107	103
108	203
109A	D205
109B	303S
110	CE201
111	501
112	501
113	D205
114	D715
115	801
116	801
117A	D205
117B	D001
118A	700MR
118B	C714AM
119	C715
120	D205
121 ALT 3	D205
122	CE201

SECTION 08 8100
GLASS AND GLAZING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of interior and exterior Glass and Glazing as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. ANSI 297.1 - Standard for Safety Glazing Materials Used in Buildings
- B. ASTM 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- C. ASTM E413 - Classification for Rating Sound Insulation
- D. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings
- E. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
- F. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
- G. 16 CFR 1201 - Safety Standards for Architectural glazing materials
- H. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials
- I. Glass Association of North American (GANA); Glazing Manual
- J. Flat Glass Marketing Association (FGMA) - Manual of Glazing
- K. NFPA 80 - Fire Doors and Windows
- L. NFPA 252 - Fire Tests of Door Assemblies
- M. Laminators Safety Glass Association (LSGA) Design Guide

1.3 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Where required, engage a qualified professional engineer licensed in the jurisdiction of the Project to design glazing.

- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 - 4. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
 - 5. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 - 6. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 - 1. Obtain tinted glass from single source from single manufacturer.
 - 2. Obtain reflective-coated glass from single source from single manufacturer.
- E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

1.5 WARRANTY

- A. Manufacturer's Special Warranty: Ten (10) years from date of Substantial Completion.

1.6 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit manufacturers technical data for each glazing material required, including installation and maintenance instructions.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.
- F. Samples: Submit 2 samples approximately 12 inch by 12 inch for each type of glass indicated. Provide 2 samples of spacers where applicable.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide glass products by one of the following:
 - 1. Anemostat
 - 2. Guardian Glass
 - 3. Oldcastle Building Envelope (OBE)
 - 4. Pilkington North America
 - 5. Technical Glass Products
 - 6. SaftiFirst
 - 7. Schott North America
 - 8. Anemostat
 - 9. Vetrotech Saint-Gobain
 - 10. Viracon, Inc.
 - 11. Vitro Architectural Glass

2.2 FLOAT GLASS

- A. Annealed float glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3.
 - 1. Thickness: 1/4"
- B. Color: Clear
- C. Tempered:
 - 1. Glass so indicated and required by federal and local regulations and the authorities having jurisdiction shall be fully tempered conforming to ASTM C 1048, Kind FT (fully tempered), Class 1 (clear).
 - 2. Provide in doors, sidelights and other designated locations.

2.3 INSULATING GLASS

- A. Factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace. and complying with ASTM E 774 for Class CBA units.
- B. Provide multi-layer low-E coated unit.
 - 1. Tinted insulating unit:
 - a. Vitro Solarban 60 on Solargray Low E or approved equal.
- C. Metal spacer insert between plies of glass to match storefront framing.
- D. Tempered:
 - 1. Glass so indicated and required by federal and local regulations and the authorities having jurisdiction shall be fully tempered conforming to ASTM C 1048, Kind FT (fully tempered).
 - 2. Provide in doors, sidelights and other locations as required by building codes.
- E. Total unit thickness: 1".

2.4 SEALANT

- A. General:
 - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
 - a. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
 - b. Products: Subject to compliance with requirements, provide one of the following:
 - (1) Dow Corning Corporation; DOWSIL 795.
 - (2) Pecora Corporation; 896.
 - (3) Tremco Incorporated; Proglaze.
 - (4) Tremco Incorporated; Tremsil 600.
- B. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Coordination with other Work: Coordinate with other work that affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Do no glazing in damp or rainy weather.
- B. Have surfaces receiving glass clean, dry and free of foreign matter. Prepare, clean and prime (as required) surfaces to which sealant is to be applied per sealant manufacturer's recommendations.
- C. Install glass types at locations shown on Drawings and according to glass manufacturer's recommended maximum size limitations and placement of setting blocks. Make adjacent glass in same glazed areas consistent in type and thickness unless otherwise noted or directed.
- D. Install glass in aluminum frame units using glazing beads furnished with the section.
- E. Install glass in hollow metal frames using specified glazing tape. Glazing stops to be applied from exterior.

3.3 CLEANING

- A. On completion of Work and just prior to job completion, clean and wash glass thoroughly. Use no abrasives, implements or methods likely to result in scratched surfaces. Replace scratched, defective or broken glass caused by improper installation at no cost to Owner.

- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 08 8723

SAFETY AND SECURITY WINDOW FILMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Transparent film applied to glass to provide shatter resistance, increase safety during blast occurrence, and increase safety during an accidental impact meeting safety glazing standard.

1.2 RELATED SECTIONS

- A. Section 08 4100 - Aluminum Framed Entrances and Storefronts.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI/NFRC 100 - 2014 - Procedure for Determining Fenestration Product U-factors.
 - 2. ANSI/NFRC 200 - 2014 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
 - 3. ANSI Z97.1 - Safety Glazing Materials Used In Buildings - Safety Performance Specifications and Methods of Test.
- B. Lawrence Berkeley National Laboratory:
 - 1. WINDOW 7.4 - Computer program used to model, analyze products made from any combination of glazing layers, gas layers, frames, spacers, and dividers under any environmental conditions and at any tilt.
- C. Consumer Products Safety Council (CPSC):
 - 1. CPSC Part 1201 - Safety Standard for Architectural Glazing Materials.
- D. General Services Administration (GSA) Performance Criteria:
 - 1. GSA TS01 2003 - Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings.
 - 2. Window Glazing Analysis Response and Design (WINGARD) Version 5.5.1 or Later.
- E. International Window Film Association (IWFA):
 - 1. Architectural Visual Inspection Standard For Applied Window Film As Adopted By The IWFA May 15, 1999.
- F. International Standards Organization (ISO):
 - 1. ISO 16933 - Glass in building -- Explosion-resistant security glazing -- Test and classification for arena air-blast loading.
- G. ASTM International (ASTM):
 - 1. ASTM C1184 - Standard Specification for Structural Silicone Sealants.
 - 2. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - 3. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
 - 4. ASTM D2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.

5. ASTM D3330 - Standard Test Method for Peel Adhesion at 180 Degree Angle.
 6. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
 7. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
 8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 9. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
 10. ASTM F 1293 - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings.
- H. Underwriters Laboratories, Inc.:
1. UL 972 - Standard for Burglary Resisting Glazing Material.

1.4 PERFORMANCE REQUIREMENTS

- A. Safety Glazing Impact resistance (performance to CPSC/ANSI Z97.1):
1. Impact resistance for film applied on 1/8 inch (3 mm) thick glass: 400 foot-pounds (55 kilogram meters) minimum to comply with ANSI Z97.1 Class A and CPSC 16 CFR 1201 Category II as safety glass.
- B. Flammability (performance to ASTM E84):
1. Flammability: Surface burning characteristics when tested in accordance ASTM E 84:
 - a. Flame Spread Index: 25, maximum.
 - b. Smoke Developed Index: 450, maximum.
- C. Abrasion resistance (performance to ASTM D1044):
1. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calibrase Wheel.
- D. Blast resistance (performance to GSA or ISO 16933):
1. Blast resistance for film applied on 1/4 inch (6 mm) thick glass that is 48 inches (121.92 cm) wide by 66 inches (167.64 cm) high with the use of FrameGard attachment system on 4 sides with a peak pressure of 12.78 psi and a positive phase impulse of 78.79 psi[HEX CHAR NOT COVERED: b7]ms: GSA Level 3A.
 2. Blast resistance for film applied on 1/4 inch (6 mm) thick glass that is 48 inches (121.92 cm) wide by 66 inches (167.64 cm) high with the use of FrameGard attachment system on 4 sides with a peak pressure of 9.0 psi and a positive phase impulse of 72.8 psi[HEX CHAR NOT COVERED: b7]ms: GSA Level 3B.
- E. Tear Resistance:
1. Puncture propagation and tear resistance tested according to ASTM D2582: Greater than 108 Newton in both the machine direction (MD) and transverse direction (TD).
- F. Forced Entry Performance (performance to UL 972):
1. Forced entry breakage and anti-intrusion resistance for film applied on 1/4 inch (6 mm) thick annealed glass and wet glazed in window frame with structural silicone sealant: Certified compliant by Underwriters Laboratories to UL 972.

- G. Windstorm Mitigation (performance to ASTM E 1866 and E1996):
 - 1. Windstorm mitigation for film applied on 1 inch nominal insulated glass units comprised of 1/4 inch (6 mm) thick annealed glass using FrameGard mechanical attachment: Category D 9 lb. 2 in. x 4 in., plus or minus 50 psf; tested in accordance with ASTM E1886 and ASTM E1996
- H. WINGARD Report (independent engineering results for window and film performance to blast mitigation):
 - 1. The contractor shall submit a test report summary showing that the proposed film system has been certified by an independent Engineering firm utilizing WINGARD 5.5.1 or later. WINGARD shall show a performance condition (2) (3A) (3B) or lower based on the General Services Administration's criteria (i.e., a non-hazard condition) and ASTM F-1642 criteria under a blast load with a minimum peak pressure of 4 psi and a minimum positive phase impulse of 28 psi-msec with the use of a (mechanical attachments system (FrameGard)) (structural silicone attachment system (Wet Glaze)) (flexible perimeter anchoring (GullWing)) on 4 sides when applied to the glazing type and sizes found at the project site. The protective products tested should be representative of those being offered (i.e., daylight installed, edge-to-edge installed, mechanically attached, etc.).

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 3300 - Submittal Procedures.
- B. Product Data:
 - 1. Manufacturer's data sheets on each product to be used.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
- C. Verification Samples: 4 inches by 6 inches (102 mm by 152 mm) minimum sample of glazing film.
- D. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years successful documented experience.
- B. Installer Qualifications:
 - 1. Installer: Glazing film shall be applied by installers with a minimum of five years successful experience installing products of the same type and scope as specified.
 - 2. Provide documentation that the installer is certified by glazing film manufacturer to perform the work specified.
 - 3. Provide references of three projects where the installer has applied safety and security film or similar nature and size. The list should include:
 - a. Name of building.
 - b. The name and telephone number of project manager.
 - c. Type of glass.
 - d. Type of film and attachment system.
 - e. Amount of film and attachment system installed.
 - f. Date of completion.

- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
- D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
 - 1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
 - 2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
 - 3. Retain mock-up during construction as a standard for comparison with completed work.
 - 4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.7 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- B. Protect from damage due to weather, excessive temperature, and construction operations.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
- B. Surface temperature: Do not apply glazing film when surface temperature is less than 40 degrees Fahrenheit.
- C. Prior to installation, the glass and frames shall be inspected for surface contamination, damage, or other defects that may adversely affect the performance of the glazing film.

1.10 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
 - 1. Madico®, Inc., which is located at: 9251 Belcher Rd. N.; Pinellas Park, FL 33782; Toll Free Tel: 888-887-2022; Tel: 727-327-2544; Email: [request info](#)

contact@madico.com); Web:<http://www.madico.com/window-film><http://www.safetyshield.com/products/>

2. Approved equals.

2.2 SAFETY AND SECURITY WINDOW FILMS

A. Basis of Design shall be SafetyShield

1. Type: Transparent, polyester, micro-thin film bonded to glass to resist impact, help contain glass shards, remain intact, and resist impact and explosive pressure and lessen blast damage; SafetyShield 1500 PS SR as manufactured by Madico, Inc.
 - a. Physical Properties.
 - 1) Thickness: (0.015 inch) (0.381 mm).
 - 2) Color: Clear.
 - 3) Construction: Multi-ply laminate.
 - 4) Adhesive type: Pressure sensitive acrylic.
 - 5) Tensile strength: (32,000 PSI) (2,250 kg per sq. cm) tested in accordance with ASTM D882.
 - 6) Breaking strength: (450 pounds per inch) (8037 grams per mm) minimum tested in accordance with ASTM D882.
 - 7) Puncture and tear strength: 108 Newton average tested in accordance with ASTM D2582.
 - 8) Peel strength: (5 pounds per inch) (89 grams per mm) minimum tested in accordance with ASTM D3330.
 - 9) Surface burning characteristics tested in accordance with ASTM E84: Class A.
 - a) Flame spread: 0 to 25 maximum.
 - b) Smoke development: 0 to 450 maximum.
 - b. Safety Glazing Performance: comply with ANSI Z97.1 and CPSC 16 CFR 1201 Category II as safety glazing.
 - c. Anti-Intrusion Performance: certified compliant by Underwriters Laboratories to UL 972.
 - d. Performance attributes for film applied to 1/4 inch (6 mm) thick clear glass tested in accordance with ANSI/NFRC 100 - 2014 and ANSI/NFRC 200 - 2014:
 - 1) Visible Light:
 - a) Transmittance: 85 percent.
 - b) Reflected: 10 percent.
 - 2) Glare reduction: 4 percent.
 - 3) Ultra violet light transmittance: less than 1 percent.
 - 4) U-value: 1.04.
 - 5) Solar energy:
 - a) Transmittance: 71 percent.
 - b) Reflected: 8 percent.
 - c) Absorbed: 21 percent.
 - 6) Shading Coefficient (SC): 0.89.
 - 7) Solar Heat Gain Coefficient (SHGC): 0.78.
 - 8) Emissivity: 0.90.

B. Safety and Security Film Attachments:

1. Provide anchoring accessories as recommended by glazing film manufacturer and as required for complete installation meeting specified performance requirements.
2. Perimeter Anchoring Angle: Extruded aluminum angle with rubber gasket insert: FrameGard Anchoring System as manufactured by Madico, Inc.

- a. Configuration: Extruded aluminum angle with recess in one flange to receive black rubber gasket. Bottom edge of other flange serrated to grip glazing film. Outside corner of anchoring angle to be rounded.
 - b. Size: (0.62 by 1.323 inches (16 by 34 mm) with rubber gasket projecting (3/8 inch) (100 mm) above shorter leg.
 - c. Attachment: Installed with screws into frame.
 - d. Performance: Glazing film extends beyond glass and overlaps onto frame. Rubber gasket insert on one flange presses against glass. Other serrated flange tightly anchors overlapping glazing film. When a blast shatters the glass, rubber gasket absorbs energy and allows glazing film to stretch while anchoring angle clamps film in place. Rounded corner of anchoring angle prevents cutting of glazing film.
 - e. Cap piece: Provide L-shaped aluminum cap to snap-lock over anchoring angle and conceal attachment screws.
 - f. Finish:
 - 1) Anchoring angle: Mill finished aluminum.
 - 2) Cap piece: (Mill finished aluminum) (Clear anodized aluminum) (Bronze anodized aluminum) (Thermoset enamel paint finish with custom color designated by Architect.).
3. Structural Silicone Sealant: One-component, self-priming, elastomeric adhesive formulated for impact-resistant protective glazing in high performance window film application complying with ASTM C1184: DowSil 995 Silicone Structural Sealant or other equivalent product approved by glazing manufacturer.
4. Perimeter Anchoring: Flexible, polymer, wing shaped, perimeter anchoring strip: GullWing as manufactured by Madico, Inc.
- a. Material: Composite of hard and flexible polymer layers and provided in rolls.
 - b. Configuration: Either 1, 1-1/2, or 2-1/4 inch wide strip with center groove as applicable to facilitate bending lengthwise into wing shape. GullWing is designed such that one-half adheres to glass with glazing film and other half to frame.
 - c. Attachment: GullWing can be anchored to glass and frame with double-sided adhesion tape with release paper or a combination of tape and structural silicone sealant.
 - d. Performance: GullWing is designed to transfer impact forces from glazing film adhered to the glass to the frame. When a blast shatters the glass, attachment will flex absorbing energy and allowing glazing film to stretch.
 - e. Color: As selected by Architect from manufacturer's standard range.
 - f. Adhesive priming solution: As recommended by glazing film manufacturer.
5. Cord restraint system: Diecast metal cleats secure energy absorbing safety cord: LifeLine as manufactured by Madico, Inc.
- a. Material: Diecast metal cleat secured to the frame. Cleats are designed to receive LifeLine safety cord that acts as the arrester line when the pane of glass leaves the window frame.
 - b. Attachment: Installed with Butress Thread Screws.
 - c. Performance: LifeLine is designed to arrest the inward travel of a filmed glass lite into the interior of the room. When a blast shatters the glass, the energy absorbing cords slow and catch the filmed lite of glass, often returning it to the direction in which it came.
 - d. Color: Silver Diecast Cleats, Energy absorbing cord as selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.1 GLAZING FILM APPLICATION

- A. Field apply glazing film to the following items in accordance with manufacturer's instructions:
 - 1. Steel framed glazed doors, sidelights, transoms, and windows.
 - 2. Aluminum framed glazed doors, sidelights, transoms, and windows.
- B. Do not apply glazing film when surface temperature is less than 40 degrees F (4 degrees C).
- C. Inspection:
 - 1. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.
 - 2. Verify glass is not cracked, chipped, broken, or damaged.
 - 3. Verify that frames are securely anchored and free of defects.
 - 4. Do not proceed until unsatisfactory conditions have been addressed.

3.2 PREPARATION

- 1. Comply with manufacturers recommendations for surface preparation.
- 2. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.
- 3. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.
- 4. Protect adjacent surfaces.

3.3 INSTALATION

- A. General Film Installation:
 - 1. Install in accordance with manufacturers written instructions and approved shop drawings.
 - 2. Accurately cut film with straight edges. Apply from edge of glass to edge of glass..
 - 3. Remove release liner immediately prior to adhering film to glass.
 - 4. Apply mounting solution to film and glass.
 - 5. Apply film to glass and removed air bubbles, wrinkles, and other defects using a squeegee. Three to five complete passes are required to completely remove mounting solution from between film and glass.

3.4 FIELD QUALITY CONTROL

- A. After installation, view film from a distance of 10 feet (3 meters) against a light colored background. Ensure appearance is uniform without streaks, bands, thin spots, and pinholes in accordance with the IWFA Architectural Visual Inspection Standard for Applied Window Film as Adopted by the IWFA May 15,1999.
- B. If installed film does not meet these requirements removed and replaced with new film.

3.5 CLEANING AND PROTECTION

- A. Inspect installation. Verify that it is complete and complies with requirements and manufacturer's instructions to provide specified anti-intrusion requirements. Correct deficiencies.
- B. Clean glass following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.

- C. Remove labels and protective covers.

END OF SECTION

SECTION 08 9100

WALL LOUVERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Wall Louvers as specified herein.

1.2 REFERENCES

- A. AAMA 2604 – High Performance Organic Coatings on Architectural Extrusions and Panels
- B. AMCA 500 – Test Methods for Louvers, Dampers and Shutters
- C. AMCA 511 – Certified Ratings Program for Air Control Devices
- D. ASCE 7 – Minimum Design Loads for Buildings and Other Structures

1.3 QUALITY ASSURANCE

- A. Product Qualifications:
 - 1. Louvers to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program.

1.4 WARRANTY

- A. Manufacturer shall provide warranty for louver systems for a period of two (2) years from date of Substantial Completion.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Manufacturer's product data including performance data for each item.
- C. Shop Drawings: Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Airolite Company, LLC
- B. Greenheck
- C. Ruskin Company

2.2 STATIONARY LOUVER

A. Fabrication

1. Model: SCH501 as manufactured by Airolite (Basis of Design)
2. Frame
 - a. Frame Depth: 5 inches (152 mm).
 - b. Material Galvanized steel, ASTM A 653, HDG G60 CS.
 - c. Wall Thickness: 16 gauge (1.6 mm), nominal
3. Blades
 - a. Style: Horizontal drainable
 - b. Material: galvanized steel, ASTM A 653, HDG G60 CS.
 - c. Wall Thickness: 16 gauge (1.6 mm), nominal.
 - d. Angle: 37 ½ degrees
 - e. Centers: 4 3/4 inches (121 mm), nominal

B. Performance Data

1. Free Area: 54 percent, nominal.
2. Maximum Recommended Air Flow through Free Area: 896 feet per minute (273 m/min).
3. Air Flow: 7741 cubic feet per minute (218 cu. m/min).
4. Maximum Pressure Drop (intake): .10 inches w.g. (24.89 Pa).
5. Water Penetration: Maximum of 0.01 ounces per square foot (3.1 g/sm) of free area at an air flow of 896 feet per minute (273 m/min) free area velocity when tested for 15 minutes.

C. Design Load: Incorporate structural supports required to withstand wind load of:

1. 20 lb/sf (0.96 kPa).
2. Louvers shall be factory engineered to withstand the specified seismic loads.
 - a. Minimum design loads shall be calculated to comply with ASCE – 7.

2.3 ACCESSORIES

A. Insect screens:

1. Manufacturer's standard

2.4 FINISHES

A. Anodized finish

1. Class II, Color Anodic Finish: AA-M12C22A41
2. Clear

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.2 INSTALLATION

- A. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.

- B. Install louvers plumb and level, in plane of wall and in alignment with adjacent work.

3.3 CLEANING

- A. Clean louver surfaces in accordance with manufacturer's instructions. Touch-up, repair or replace damaged products.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 2216

NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Non-Structural Metal Framing and Direct-hung Grid Suspension Systems as shown on the Drawings and as specified.

1.2 REFERENCES

- A. ASTM C636, "Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels" for Direct-hung Grid Suspension Systems
- B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members
- C. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
- D. AISI S200- North American Standard for Cold-Formed Steel Framing General Provisions
- E. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
- F. ASTM E90 Standard Test Method for laboratory measurement of airborne sound transmission loss of building partitions and elements
- G. ASTM E119 Standard Test Methods for fire tests of building construction and materials
- H. Gypsum Construction Handbook, current edition
- I. IBC Section 2211 - Cold Formed Steel Light Frame Construction.

1.3 QUALITY ASSURANCE

- A. Direct-hung Grid Suspension Systems: Applicators shall be approved by manufacturer of material or system being installed.
- B. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit data for each type of member specified herein.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically prior approved by the Architect, non-load bearing framing shall be products of one of the following manufacturers, subject, however, to compliance with specifications requirements.
 - 1. CEMCO
 - 2. Clark Dietrich Building Systems
 - 3. Marino\WARE
 - 4. MBA Building Supplies
 - 5. SCAFCO
 - 6. United Metal Products
- B. Except as otherwise specified herein Direct-hung Grid Suspension Systems system shall utilize products of one of the following manufacturers subject to compliance with specification requirements and all applicable codes.
 - 1. Armstrong World Industries
 - 2. Chicago Metallic Corporation
 - 3. Donn Corporation

2.2 MATERIALS

- A. Studs, Track and Furring:
 - 1. Cold-formed galvanized steel in conformance with AISI Specifications for Design of Cold-formed Steel Structural Members. Roll formed 20 or 25-gauge steel in sizes indicated, conforming to ASTM C645.
 - a. Use 20 gauge at locations of television/monitor support brackets.
 - b. Use 20 gauge for doorjamb.
 - c. Use 20 gauge for walls to receive ceramic tile.
 - d. Use 20 gauge for walls over 14 feet high.
 - e. Use 25 gauge for all interior partitions unless noted otherwise.
 - f. Use 25 gauge for all misc. furring, channels, track, etc. unless otherwise shown or required by code.
 - 2. All stud and track components shall be electro galvanized; G40 grade at all exterior walls and interior walls subject to moisture or humidity (kitchens, shower areas, etc.), G40e or G40EQ at interior partitions not subject to moisture or humidity.
 - 3. Fire and sound rated construction: Provide studs, track and furring in accordance with assemblies specified or noted on Drawings.
- B. Runner Track:
 - 1. Cold-formed galvanized steel in conformance with AISI Specifications for Design of Cold-formed Steel Structural Members.
 - 2. Thickness equal to stud thickness minimum or heavier per design requirements.
- C. Deflection Track:
 - 1. Cold-formed galvanized steel in conformance with AISI Specifications for Design of Cold-formed Steel Members.
 - 2. Thickness equal to stud thickness minimum or heavier per design requirements.
 - 3. Standard Leg 2-1/2 inches (64 mm) with vertical slot of 1-1/2 inches (38 mm) in leg.
- D. C-T Studs and Tabbed J Track: Cold-formed galvanized steel, approved for the use intended based on a current National Evaluation Service Report: Size and gauge of studs and track as indicated on drawings.
 - 1. Designation and size as indicated on the drawings.
 - 2. Designation: C-T stud with J track, 2-1/4 inches (57 mm) leg.

3. Designation: C-T stud with J track, 3 inches (76 mm) leg.
 4. Size: 2-1/2 inches (64 mm).
 5. Size: 4 inches (102 mm).
 6. Size: 6 inches (152 mm).
 7. Sheet Thickness: 25 gauge (0.021 inches) (0.53 mm) (2-1/2" and 4").
 8. Sheet Thickness: 20 gauge (0.040 inches) (1.01 mm) (0.036 inches) (0.9 mm) and (0.038 inches) (0.97 mm) (2-1/2", 4" and 6").
 9. Deflection Limitation: L/240
- E. Resilient Furring Channels: 1/2-inch (12.7 mm) deep, steel sheet members designed to reduce sound transmissions.
- F. Channel Bridging: 16-gauge bare metal thickness, with minimum 3/4-inch side flanges (or manufacturer's standard bridging components where acceptable to A.H.J.).
- G. Backing Plate: 16-gauge, min. 8" wide
- H. Suspended Ceiling components (Conventional Framing Option):
1. Furring channels: 25-gauge rigid furring channels conforming to ASTM C645
 2. Main runner channels: Cold rolled sections, 1-1/2 inches, formed of No. 16 gauge steel.
 3. Hanger wires; 8 gauge, double annealed and galvanized, conforming to FS QQ-W-461, Type I.
 4. Brackets: 20 gauge.
 5. Tie Wire: 18 gauge galvanized.
- I. Suspension system (Direct-hung Grid Suspension Systems Option):
1. Ceiling suspension system shall be "Chicago Metallic No. 640 System heavy duty" or "Armstrong Drywall Grid System" with components formed from commercial quality cold rolled steel hot-dipped galvanized or corrosion-resistant finish as standard with the manufacturer, unless noted otherwise. Fire rated ceiling suspension systems shall be Chicago Metallic Fire Front 650 System heavy duty bearing UL classification marking, with components formed from commercial quality cold rolled steel electro-zinc coated, or prior approved equal.
 2. Main-runners: Shall be a minimum of 1-1/2 inch in height with an exposed capped face of 15/16 inch in width, nominally 12 feet long.
 3. Cross-runners: Shall be a minimum of 1-1/4 inch in height with an exposed capped face of 15/16 inch in width.
 4. Furring channels: 25-gauge furring channels confirming to ASTM C645 7/8" or 1-1/2" deep.
 5. Fire Rated Cross Tees: shall be a minimum of 1-1/2 inch in height with an exposed capped face of 15/16 inch in width, nominally 2 feet and 4 feet long.
 6. Hanger Wire: Shall be galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gauge.
 7. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
 8. Drywall Moldings: provide moldings compatible with Manufacturer's standard system.
- J. Fasteners and Attachments:
1. Sheet metal: Self-drilling, self-tapping screws; steel, complying with ASTM C 1513; galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.
 2. Anchorage devices to structural components: Power-driven or powder actuated, drilled expansion bolts, or screws, with sleeves.
 3. Provide bolts, nuts and washers as required.

4. Finish: Cadmium plating, ASTM A165, type NS for use in exterior or "wet" applications.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas to receive Work and report in writing, with a copy to Architect, detrimental conditions. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for correction(s) Architect may require. Commencement of Work will be construed as acceptance of conditions.
 1. Verify before proceeding with this Work that required inspections of existing conditions have been completed.
- B. Coordination with other Work: Coordinate with other work that affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION - WALL FRAMING

- A. Install cold-formed framing in accordance with requirements of current versions of ASTM C754, AISD-WSD AISI-NAS, AISI-WSD, AISI-Header and the current Gypsum Construction Handbook and IBC Section 2211. System design shall resist horizontal loads (regular and seismic) as required by IBC and local AHJ.
- B. Runners: Attach at floor and ceiling to structural elements with suitable fasteners located 2 inches from each end and spaced 24 inches on center. Fasten to suspended ceilings with approved fasteners spaced 16 inches on center.
- C. Deflection track: Install direct to structure above using approved fastening method. Where fire rated requirements or STC ratings apply provide approved fire-stopping and/or acoustic sealants as applicable.
- D. Studs: Position studs vertically, engaging floor and ceiling runners and spaced 16 or 24 inches on center, as indicated on Drawings.
 1. When necessary, splice studs with 8-inch nested lap and two positive attachments per stud flange, near the ends of the splice.
 2. Place studs in direct contact with all doorframe jambs, abutting partitions, partition corners and existing construction elements.
 3. Provide double 20-gauge studs at doorjamb.
 4. Isolate studs from masonry or concrete exterior wall surfaces.
 5. Provide one pair of 20-gauge steel studs, running from floor to structure above, at each wall mounted television location.
 6. At deflection track allow minimum 1/2" at top of studs unless indicated otherwise or special conditions exist requiring greater clearances.
- E. Blocking, bridging and other components:
 1. Where allowed by code and A.H.J. provide fire-treated wood blocking for attachment of fixtures, toilet and bathroom accessories, grab bars, door stops, television/monitor mounting brackets, toilet partitions and urinal screens and other items anchored to partitions or walls.
 2. Install continuous metal backing plate at all locations where fixtures or equipment, including casework attaches to and is supported by the wall framing unless provided for as described above.
 3. Install framing between studs for attachment of electrical boxes and other mechanical and electrical items.

4. Attach wall stud bridging when required in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations, code requirements for fire rated walls, seismically rated walls and A.H.J. Also provide bridging at walls where sheathing does not extend to deck or are sheathed on one side only.
5. Bridge stud partitions at mid-height for partitions 10 feet high or less, and at 5 feet on center for partitions greater than 10 feet, with 1-1/2 inch channels through studs secured in place. Lap channels by nesting one inside the other to a depth of at least 8 inches and wire tie together, in two (2) places.
6. Provide jack studs or channels between bottom track and sill openings; between opening and door lintels; or between headers and top track, or between headers and top track, and elsewhere as required to provide adequate support for collateral wall materials.
7. Provide for structural vertical movement using means in accordance with manufacturer's recommendations.
8. Provide bracing of steel stud framing to deck or structure as detailed. Use only mechanical attachments.
9. Install fire-stopping and fire blocking in partitions and walls using materials and methods as required by applicable codes and A.H.J.

F. Partial Height Walls:

1. At walls that do not extend full height and are not otherwise braced, provide and install 2-1/2 inch x 2-1/2 inch x 3/16 inch tube steel stiffeners welded to base plate and anchored to floor with four (4) 1/2 inch x 2-1/2 inch expansion anchors. Set stiffeners at 4'-0" O.C. and secure to continuous 20 gauge top track.

G. Shaftwall:

1. Install all components as required to meet listed assembly ratings and as required by A.H.J.

H. Wall Furring Installation:

1. Attach metal furring channels vertically spaced 24 inches on center U.N.O. to masonry or concrete surfaces with hammer set or power-driven fasteners or concrete stub nails staggered 24 inches on center on opposite flanges.
2. Nest channels 8 inches at splices and anchor with 2 fasteners in each wing.
3. Ensure framing provides true and flat surfaces, ready to receive finish.

3.3 INSTALLATION - SUSPENDED CEILINGS (CONVENTIONAL FRAMING OPTION)

A. General:

1. Except where otherwise indicated, provide 1-1/2 inch main runner channels spaced on 4 foot centers and metal furring channels spaced on not over 16 inch center.
2. Neither main runners nor cross furring shall be let into nor come in contact with abutting masonry walls or partitions.
3. Locate main runner within 6 inches of the wall to support the ends of the furring channels and locate hangers to support the ends of the main runners.

3.4 INSTALLATION - SUSPENSION SYSTEM (DIRECT-HUNG GRID SYSTEM OPTION)

A. General:

1. Suspend main runners from structure above, spaced 48 inches on center using not less than 12-gauge wire, spaced per manufacturer's recommendations for the loading, but not less than 48 inches on center and accurately leveled. Support main runners no further than 12 inches from wall. Main runners may not be supported by wall angle.

2. For fire rated ceiling systems, suspend the grid from structure above, using No. 12 SWG galvanized steel wire, spaced per manufacturer's recommendations for the loading, but not less than 48 inches maximum on center and at tees at walls, accurately leveled.
- B. Installation shall be braced against seismic upset per IBC standards where required by local jurisdictions.
1. Install 48-inch cross tees 24 inches on center into pre-routed openings in main beams by means of factory installed end clips.
 2. Support cross tees by main runners at the required center distances within 1/32 inch. This tolerance shall not be cumulative.
 3. No section of main runner or cross tee to be less than 48 inches long nor be supported by less than 2 hanger wires.
 4. At perimeter areas secure angle mold to vertical surfaces using sheet metal screws providing 3/8-inch minimum penetration into studs or other structural member spaced not more than 24 inches on center.
 5. Cross tees shall butt exposed edge of perimeter molding.
 6. System shall permit installation of recessed light fixtures upon the flanges of the system.
 7. Universal splices or other types, however devised, whose use would obstruct the passage of recessed lights through grid openings or make untenable their reposition upon the flanges of the members, shall not be used.
- C. Finished grid system shall be securely fastened together to form a rigid frame. Align to form true, level surface and straight lines.
- D. Hanger wires shall be securely fastened to structure in a manner approved by the ceiling system manufacturer, and in strict compliance with all governing codes.
- E. Obtain information from involved trades and provide additional hanger wires, framing members, and supports in grids as required for lighting and mechanical fixtures, equipment, and other loadings imposed on grids, with a safety factor of 4.0 minimum. Provide main grid tees along edges of mechanical and lighting fixtures bearing on the grids.
- F. Surface-mounted lights shall be suspended from structure above by not less than 12-gauge galvanized steel wire not more than 1-inch diameter tubing passing through a maximum 2 inch hole in ceiling membrane. Provide additional hanger wires where projection screens, track lighting, etc. are scheduled for installation directly to the ceiling suspension system.
- G. Provide light fixture protection at recessed and semi-recessed lights in fire-rated ceilings and/or floor/ceiling assemblies. Install per manufacturer's printed instructions and in accordance with applicable codes. Maintain recommended and required clearances between fixtures and light protection elements. See Drawings for fire-rated ceilings and light fixture locations and types.

3.5 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 2423
PORTLAND CEMENT STUCCO

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of three-coat Portland Cement Stucco system as shown on the Drawings and specified herein.

1.2 REFERENCES

- A. ASTM C150: Standard Specification for Portland Cement
- B. ASTM C926: Standard Specification for Application of Cement Based Plaster
- C. ASTM C9206: Standard Specification for Finishing of Hydrated Lime
- D. ASTM C847: Standard Specification for Metal Lath
- E. ASTM C1032: Standard Specification for Woven Wire Plaster Base
- F. ASTM C897: Standard Specification for Finishing of Hydrated Lime
- G. TLPCA: The Lath and Plaster Systems Manual

1.3 PERFORMANCE REQUIREMENTS

- A. Fire-Test-response Characteristics: For Portland cement plaster assemblies with fire-resistant ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Stucco system shall be in conformance with the applicable sections of the International Building Code Chapter requirements for fire rated assemblies indicated in the Drawings.

1.4 QUALITY ASSURANCE

- A. Cementitious stucco materials shall all be obtained from a single source.
- B. Installation of water resistive barrier shall be performed by factory trained and approved installers.
- C. Mock-Ups: After color and texture samples have been reviewed, accepted and returned, construct a mock-up of each type not less than 16 square feet in size, using equipment and techniques proposed for use on Project, including typical required lathing accessories. Panels may be constructed as a portion of finished work, provided reviewed and accepted panel is clearly identified for future reference. Each reviewed and accepted panel becomes the standard of comparison for the stucco finish for Project.

1.5 SUBMITTALS

- A. Submittal requirements are specified in section 01 3300, Submittal Procedures.
- B. Product Data: Data for each type of product indicated.
- C. Samples: 12 by 12 inches (305 by 305 mm) for each type of finish coat indicated.

PART 2 PRODUCTS

2.1 SUMMARY

- A. Portland cement/plastic Portland cement: Mill-mixed blend of Portland cement, ASTM C150, Type II, high-performance pozzolan, hydrated lime, and fiber. Where Plastic Portland Cement plasticizing agents may be added in manufacturing process not to exceed 12 percent of total volume. It must also comply to the following specifications:
 - 1. Water retention: Exceed ASTM C1328. Minimum 80%.
 - 2. Air content: Exceed ASTM C1328. Maintain 12% - 16%.
 - 3. Compressive Strength: Exceed ASTM C1328. Seven (7) day compressive strength of 1400 psi. twenty-eight (28) day compressive strength of 2500 psi, ninety (90) day compressive strength of 3000 psi.
 - 4. Time of Setting: Exceed ASTM C1328. Initial set not less than 120 minutes. Final set no longer than 300 minutes.
 - 5. Autoclave Expansion: Exceed ASTM C1328. Not more than 0.05%.
 - 6. Fineness: Exceed ASTM C1328. Not more than 18%.
- B. Sand for base coats: in accordance with ASTM C897 and ASTM C35.
- C. Sand for finish coat: silica sand of size necessary to achieve specified finish texture.
- D. Wire fabric lath: For vertical and horizontal assemblies, ASTM C1032, self-furring galvanized steel woven-wire fabric. Weight shall be 1.1 pound, 0120 inch (No. 11 B. W. Gage), 2 inch x 2 inch, 1/16 pound, 0.65 inch (16 B.W. Gage), 2 inch x 2 inch or 1.4 pound, 0.049 inch (No. 18 B.W. Gage), 1 inch x 1 inch material.
- E. Expanded-metal lath: ASTM C847 with ASTM A653/A 653M, G60 (Z180), hot-dip galvanized zinc coating. Weight shall be 2.5 or 3.4 pounds per square yard.
- F. Water resistant barrier: Dupont Tyvek Stucco Wrap
- G. Lime: Hydrated lime per ASTM C206 or C207.
- H. Accessories: Coordinate depth of trim and accessories with thicknesses and number of plaster coats required. When materials are identified in the Drawings with code initials, such as, WWS, they are referencing, specific items that are designations for products, as manufactured by Stockton Products, Test Report ER 1186, or equal.
 - 1. Zinc and Zinc-Coated (galvanized) Metal Accessories:
 - a. Weep Screed (J-B / J-8): Fabricated from hot-dip galvanized steel sheet metal; ASTM C1063; J-bead shape having 1/2-inch weep holes and formed with perpendicular surfaces.
 - b. Casing Beads (J_B): Fabricated from hot-dip galvanized steel sheet metal, ASTM C1063; in square-edged style with expanded flanges.
 - c. Narrow Control Joints (NVS): Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of un-perforated screeds in

- V-shaped configuration for 1/8 inch joint; with perforated flanges and removable protective tape on plaster face of control joint.
- d. Wide Control Joints (WVS): Fabricated from hot-dip galvanized steel sheet metal, ASTM C1063: one-piece-type, folded pair of un-perforated screeds in V-shaped configuration for 1/8 inch joint; with perforated flanges and removable protective tape on plaster face of control joint.
- e. Two-Piece Expansion Joints (AES): Fabricated from hot-dip galvanized steel sheet metal, ASTM C1063; formed to produce slip-joint and square-edged reveal that is adjustable as 3/4 inch, wide sizes, as indicated in the drawings; with perforated flanges.
- f. Inside Corner Bead (ICT): Fabricated from zinc-coated (galvanized) steel metal bent in W-shape.
- g. Soffit Vent Reveal (SVR): Fabricated from hot-dip galvanized steel sheet metal as indicated in the drawings.
- h. Window Termination Point (WTP): Fabricated from hot-dip galvanized steel sheet, ASTM C1063: formed to produce drip edge for door and window openings as indicated in the drawings.
- i. Other metal accessories indicated in the drawings and identified by manufacturer's code initials.
- 2. Zinc and Zinc-coated (Galvanized) Wire Accessories:
 - a. External-Corner reinforcement (ÇÅ): Fabricated from wire lath bent with projecting nose wire at the corner; having 2-1/2 inches legs with ASTM A1063 hot-dip galvanized zinc coating.
 - b. Bull nose-External-Corner reinforcement (BN): Fabricated from wire lath projecting to form a 7/8 inch radius corner shape having 2-1/2 inches legs with ASTM C1063 hot-dip galvanized zinc coating.
 - c. Arch-External-Corner reinforcement (AA): Fabricated from wire lath bent to form square corner shape having 2-1/2" legs with ASTM C1063 hot-dip galvanized zinc coating.
 - d. Internal-Corner reinforcement (CRT): Fabricated from wire lath projecting to form square corner shape with ASTM C1063 hot-dip galvanized zinc coating.
 - e. Other wire accessories indicated in the drawings and identified by manufacturer's code initials.
- 3. Extruded Aluminum Accessories:
 - a. Channel Screed (PCS-DA): Fabricated from a natural aluminum finished extrusion, ASTM B209, providing a reveal in sizes, as indicated in the drawings.
 - b. Other aluminum accessories indicated in the drawings and identified by manufacturer's code initials.

2.2 PROPORTIONS AND MIXING

- A. Thoroughly mix materials with batch type mechanical mixer for minimum two minutes, using minimum amount of water to produce proper consistency for application. Proportion materials so batches are identical.
- B. Proportions for Scratch/Brown/Finish Coats as Portland Cement, Portland Cement/lime Plaster, or Plastic Portland cement, as proportioned by volume in accordance with following table:

<u>PORTLAND CEMENT</u>	<u>PLASTIC PORTLAND CEMENT</u>	<u>PORTLAND CEMENT-LIME PLASTER</u>	<u>LIME</u>	<u>SCRATCH</u>	<u>SAND BROWN</u>	<u>FINISH</u>
One Part			20 Pounds	4 Parts	5 Parts	3 Parts
	One Part		One Part	4 Parts	4-1/2 Parts	3 Parts
		One Part	One Part	4 Parts	5 Parts	3 Parts

- C. Thoroughly mix Portland cement plaster for the three coats in proportions specified above. Use only sufficient water to attain proper consistency for application. When plastic Portland cement is used, do not add lime or other plasticizing agents at Worksite. Determine proper consistency for machine applied Portland cement plaster by slump test. Take material from nozzle of plastering machine hose for slump test. Maximum allowable slump shall be 2-1/2 inches, using a 2-inch by 4-inch by 6-inch slump cone. Reduce aggregate quantities accordingly to maintain workability.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Exterior Plasterwork: apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C). Do not apply cement plaster unless minimum ambient temperature of 50 deg F (10 deg C) has been maintained for a minimum of 48 Hours prior to application and until plaster is cured. Do not apply, when freezing temperatures are anticipated within 24 hours. Do not apply plaster during rainy, damp or foggy weather. Protect plaster from uneven and excessive evaporation during hot, dry weather.

3.2 PREPARATION

- A. Examine wall construction to ensure insulation, pipes, conduits, ducts, vents, supports and other items that will be concealed by lath and plaster have been installed, inspected, tested and approved by regulatory agencies having jurisdiction and correct unsatisfactory conditions.
- B. Examine grounds, beads, lathing, furring, and other accessories before plastering starts; ensure products are true-to-line, square, curved, level, and plumb as applicable to finish plaster surface.
- C. At framed construction, attach the weather resistant barrier material horizontally with upper layer overlapping the lower layer not less than 2 inches (51 mm). Where vertical joints occur, the material shall be lapped not less than 6 inches (152 mm). Lap the material over the flange of weep screeds.
- D. At concrete or masonry substrate wet the base by applying fog coat of water to provide a uniform moist condition.

3.3 APPLICATION OF WATER RESISTIVE BARRIER

- A. Install materials in strict compliance with manufacturer's recommendations for system.
- B. Provide a multilayered system in compliance with all applicable codes and requirements of AHJ.

3.4 APPLICATION OF METAL LATH AND ACCESSORIES

- A. General: Conform to requirements of referenced WLPDIA Manual, Chapter Two. Install metal lath with true even surfaces and without sags or buckles. Lath to be furred out from supports not less than 1/4-inch, except where flange width of metal supports is less than one inch. Set accessories plumb, level and true to line, shim where necessary, miter at corners. Tightly fit/align exposed joints and install sections in lengths as long as practicable.
- B. Lath installation: Apply metal lath with long dimension at right angles to supports, shingle fashion. Stagger ends of lath to avoid continuous joint on same support. Lap diamond mesh lath at sides not less than 1/2 inch and not less than one inch at ends. Lap edges of rib lath by nesting outside ribs or selvage. Lap rib lath one inch at ends. Welded and woven wire lath – lap one full mesh at sides and ends. Lap ends at supports. Butt lath into internal angles and reinforce angle with corner reinforcement material or extend lath around corners to nearest stud. Attach with specified nail or screw connectors, except where wire ties are used for strip lathing, where no studs exist for other attachment types.
- C. Control and expansion-joint material: Cut and separate reinforcement material behind expansion and control joints. Install joints in locations according to ASTM C1063, where indicated on the Drawings or as follows:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes.
 - a. Vertical surfaces: 144 sq. ft. (13.4 sq. m.)
 - b. Horizontal and other non-vertical surfaces: 100 sq. ft. (9.3 sq. m.)
 - 2. At distances between control joints of not greater than 18 feet (5.5m) on center.
 - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2:1.
 - 4. Where control joints or expansion joints occur in surface of construction directly behind plaster.
 - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
- D. Corner Reinforcement: Install full length of outside corners.
- E. Casing Beads: Install for free edges, where plaster abuts other finish material, and elsewhere, as indicated.
- F. Inside Corner Reinforcements: Install at inside corners, except where lath is carried around corners.
- G. Channel and Base Screeds: Install at top of base of wainscot and elsewhere, as indicated.
- H. Strip lath at openings: When control joints are not provided at corners of windows or other openings, reinforce corners of openings with 9 inch by 24 inch strips of metal lath material as reinforcement at a 45-degree orientation centered on jamb-to-head corner convergence or centered on jamb-to-sill corner convergence. Attach reinforcement corners to lath with wire tie material.
- I. Foundation Weep Screeds: Install at bottom of exterior Portland Cement Plaster flush with or below the top of foundations and elsewhere, as indicated. Install screeds behind the water resistant with the barrier lapping over and terminating at the screed flange along with the lath.

3.5 APPLICATION OF PLASTER

- A. General: Spray or trowel apply plaster to metal lath for a minimum uniform thickness in three (3) coats to a thickness not less than 7/8 inch over framed construction and in two (2) coats not to a thickness not less than 5/8-inch thickness over a concrete/masonry base. Provide finish exterior plaster plumb, true and even within 1/8-inch tolerance in five feet. Moist cure for 48 hours with regular fogging spray after stucco has taken its initial set (2 – 4 hours). Allow stucco to cure for thirty (30) days or until ph is 9.0 or lower before applying elastomeric-type paints.
- B. Scratch coat (first coat): Apply full 3/8-inch coat with sufficient material and pressure to form good keys on metal lath. Embed and fill spaces of lath and score horizontally. Keep moist 48 hours before second coat is applied.
- C. Brown coat (second coat): Apply over dampened scratch coat in full 3/8-inch coat straight and true surface, leaving surface sufficiently rough to ensure adequate bond for finish coat for framed construction. Apply over dampened scratch coat in full 1/4-inch coat, plus extended material to produce the texture at concrete or masonry base. Keep moist 48 hours and then let dry.
- D. Finish/texture coat (third coat): Apply over dampened brown coat in full 1/8-inch coat out to face of grounds, plus additional material to produce the approved texture. Keep moist 48 hours and then let dry.

3.6 CLEANING

- A. Remove joint protection coverings clean joints/channel screeds free of plaster, clean over-spray from other surfaces and patch defective work.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 2900

GYPSUM BOARD

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of Gypsum Board systems as shown on Drawings and as specified herein. Gypsum board used in conjunction with roofing systems is specified in that Section.

1.2 REFERENCES

- A. ASTM C475 - Standard Specifications for Joint Treatment Materials for Gypsum Wallboard Construction
- B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board
- C. ASTM C1177 - Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- D. ASTM C1178 - Specification for Glass Mat Water-Resistant Gypsum backing panel
- E. ASTM C1355 - Specification for Glass-fiber Reinforced Gypsum Composites
- F. ASTM C1396 – Standard Specification for Gypsum Board
- G. ASTM C1467 - Standard Installation of Molded Glass-fiber Reinforced Gypsum Parts
- H. ASTM C1629 - Classification for Abuse-Resistant Non-decorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
- I. ASTM D3273 - Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- J. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- K. ASTM E695 - Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading
- L. GA-214 – Recommended Levels of Gypsum Board Finish

1.3 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency. Where hourly fire ratings are indicated or required, provide components and assemblies meeting requirements of agencies having jurisdiction.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 QUALITY ASSURANCE

- A. Comply with applicable requirements of "Specifications for the Application and Finishing of Gypsum Wallboard", GA-216 and "Fire Resistance Manual" GA-600 by the Gypsum Association, except where more stringent requirements are called for herein, in local codes or by manufacturer of wallboard.

1.5 SUBMITTALS

- A. General: Submittals requirements are specified in Section 01 3300, Submittal Procedures.
- B. Provide manufacturer's technical information for each material type indicated. Do not submit material samples unless specifically requested.
- C. Samples: Submit two (2) samples of each type of wall texture specified for approval prior to application of texture.
- D. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Product Data: For adhesives and sealants indicating compliance with General Emissions evaluation and VOC content requirements.
 - 4. Product Data: For interior products indicating compliance with General Emissions evaluation.
 - 5. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, preference will be given to products with publicly available information:
 - a. Environmental product Declarations:
 - b. Material Ingredients – Documentation demonstrating the chemical inventory of the product to at least 0.1% (1000ppm).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, gypsum board shall be products of one of the following manufacturers, subject to compliance with specifications requirements
 - 1. Certaineed Corporation
 - 2. Georgia Pacific
 - 3. National Gypsum Company
 - 4. Pabco Gypsum
 - 5. United States Gypsum Company

2.2 MATERIALS

- A. Gypsum Board: All gypsum board shall be 5/8-inch-thick, tapered edge with square ends; Type X, unless otherwise noted. Gypsum board shall conform to applicable sections of ASTM C1396.
- B. Gypsum board core material to provide "VOC absorption".

1. Moisture-Resistant Gypsum Board: Walls in toilet areas, kitchens and other high moisture areas and where indicated on Drawings. Achieve score of 10 per ASTM D3273 and 0 per ASTM G21
 2. Exterior Gypsum Sheathing: glass mat panel conforming to ASTM C1177.
- C. Tile Backer Board: for use in all shower areas, tub surrounds, and other locations subject to regular direct contact with water and as indicated on the Drawings.
1. 5/8" heat-cured, acrylic coated, fiberglass faced sheet with moisture resistant core containing no asbestos or formaldehyde.
 2. Mold growth: Not less than 10 per ASTM D3273 Microbial resistance: No supported growth per ASTM D6329.
- D. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc or Paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- E. Exterior Trim: ASTM C 1047.
1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- F. Aluminum Trim: Extruded accessories of profiles and dimensions indicated. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc or Paper-faced galvanized steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- G. Exterior Trim: ASTM C 1047.
1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- H. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
- I. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
- J. Fasteners and Adhesives:
 1. Screws: Self-tapping, self-drilling sheet metal screws, blued steel, counter sunk Phillips heads. Screws shall be in lengths as required to accommodate thickness of gypsum board and meet all applicable codes and standards.
 2. Direct Application Adhesive: Low odor, Low VOC Adhesive meeting ASTM C557.
- K. Joint Compound and Texture Material: Provide type as recommended by gypsum board manufacturer for exposure and finish requirements.
- L. Acoustical Sealant: For sound partitions as indicated on Drawings, provide acoustical sealant in accordance with Section 07 9200, Joint Sealants.
- M. Air/water Barrier Sealant: Tremco "Dymonic 100" and "Spectrum1" as recommended by the panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine sub-surfaces to receive Work and report in writing, with a copy to Architect, detrimental conditions. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for correction(s) Architect may require. Commencement of Work will be construed as acceptance of sub-surfaces.
- B. Coordinate with other work that affects, connects with, or will be concealed by gypsum board work.
- C. Verify locations of expansion/control joints and coordinate with other trades, accessories, equipment etc.

3.2 PREPARATION

- A. Protection: Protect other work installed previous to gypsum board installation. Provide closures for exterior openings where required.
- B. If framing members are out of alignment, bowed or warped, correct to make true surfaces before application of wallboard.

3.3 INSTALLATION

A. Gypsum Board:

1. Install gypsum board in accordance with ASTM C840-Standard Specification for Application and Finishing of Gypsum Board, Gypsum Association Standards and manufacturer's instructions.
2. Unless otherwise indicated erect single layer gypsum board vertically, with edges and ends occurring over firm bearing except those ends and edges that are perpendicular to framing members. Comply with required UL, CBC, or GA fire rated assembly.
3. Erect double layer gypsum board with base layer placed in most economical direction with second layer placed parallel to base layer. Off-set joints of second layer from joints of base layer by at least 12 inches or as dictated by building code.
4. Use wallboard of the maximum practical length to minimize end joints. Arrange joints on opposite sides of partition so that they occur on different studs.
5. Wherever gypsum board terminates against dissimilar materials, install "J" type metal edge reinforcement.
6. Provide vertical expansion joints at 50 feet O.C. at continuous walls. Provide expansion joints at framed furring at inside face of masonry walls at locations of masonry expansion joints.
7. Fire-Rated Assemblies: Install fire-rated gypsum board assemblies in accordance with assembly requirements and authorities having jurisdiction. Where recessed panels or other wall mounted accessories are to be located in a rated assembly that require the penetration or interruption of the rated envelope, frame around and install gypsum board in a manner satisfactory to the local authorities having jurisdiction to maintain the rating integrity of that assembly.
8. At sound control partitions, provide full running beads of acoustical sealant at perimeters of such walls, both sides and where gypsum board forms a juncture with other walls or surfaces.
9. Install tile backer panels in strict accordance with manufacturer's recommendations and requirements of TCA for the installation method indicated.
10. Tolerances: Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

B. Finishes:

1. Level of Finish: Finish gypsum board surfaces in accordance with publication GA-214 and ASTM C840. Unless noted otherwise the following levels of finish shall be provided.
 - a. Level 1: For plenum, attic or other concealed areas. Also known as "fire-taping".
 - b. Level 2: For utility rooms, janitor closets and surfaces to receive tile or similar finishes.
 - c. Level 3: For walls to receive heavy textures where appearance is not critical.
 - d. Level 4: For medium to light textures flat or eggshell paint finishes.
 - e. Level 5: For light and smooth textures, vinyl wall coverings, gloss and semi-gloss paints.

C. Texture:

1. Prior to applying texture to gypsum wallboard surfaces apply one coat of wall primer/sealer. Color of the primer/sealer shall be tinted to a color to contrast with the texturing material(s).
2. Apply texture to gypsum wallboard surfaces scheduled to be painted. Unless otherwise noted on Drawings, apply materials to produce a texture finish to match the approved sample, type as indicated below.
 - a. Light Orange Peel.

3.4 LABELING AND IDENTIFICATION

- A. Fire rated walls and smoke barrier walls shall be identified as such and labels applied at conspicuous locations above the finished ceiling line on both sides of wall at approximately 15' o.c.
- B. Labels shall indicate walls as "Fire Rated" or "Smoke Barrier" and include hourly rating as indicated on plans.
- C. Labels shall be spray-stencil, self-adhered, or other acceptable application. Text shall be 3" min. and in contrasting color.

3.5 PROTECTION

- A. Maintain temperature of installed gypsum board spaces in range of 55 degrees to 90 degrees F. Ventilate as required to eliminate excessive moisture.
- B. Repair or replace damaged Work at no additional cost to Owner.

3.6 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 3000

TILING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Tiling, associated trim and all installation materials and accessories as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. ANSI A108/A118/A136 - Installation of Ceramic Tile (all applicable sections)
- B. ANSI A137.1 - Standard Specification for Ceramic Tile
- C. ASTM C150 - Standard Specification for Portland Cement
- D. ASTM C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
- E. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products
- F. ASTM C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
- G. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
- H. ASTM C503 - Standard Specification for Marble Dimension Stone
- I. ASTM C615 - Standard Specification for Granite Dimension Stone
- J. ASTM C629 - Standard Specification for Slate Dimension Stone
- K. ASTM C847 - Standard Specification for Metal Lath
- L. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- M. Tile Council of North America (TCNA): Handbook for Ceramic, Glass and Stone Tile installation

1.3 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ANSI A137.1 (DCOF AcuTest Method).

1.4 QUALITY ASSURANCE

- A. Tile shall be set by expert journeyman tile setters.
- B. Single Source Responsibility
 - 1. Obtain each type and color of tile from a single source.
 - 2. Obtain each type and color of mortar, adhesive and grout from the same source.
 - 3. Tile containers shall be grade sealed. Seals shall be marked to correspond with the marks on the signed "Master Grade Certificate".

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit manufacturer's product data for each tile type and recommended procedures for mixing materials and setting tile.
- C. Samples: Submit two (2) samples of each type of tile required, marked with manufacturer's name and location where tile is to be installed. Approval must be obtained prior to order placement.
- D. Manufacturer's Certificate:
 - 1. Certify that products meet or exceed specified requirements.
 - 2. For each shipment, type and composition of tile provide a "Master Grade Certificate" signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.
- E. Maintenance Data: Provide manufacturer's recommended cleaning methods as part of close-out documentation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, tile shall be products of one of the following manufacturers, subject to compliance with specification requirements.
 - 1. Crossville Ceramics
 - 2. Dal-Tile Corporation
 - 3. Interceramic

2.2 TILE

- A. Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Tile shall also be provided in accordance with the following.
 - 1. Factory blending: For tile exhibiting color variations within the ranges selected blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
 - 2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
 - 3. Factory applied temporary protective coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with a protective film.
- B. Unglazed Mosaic tile:
 - 1. Manufacturer: Daltile.

2. Moisture Absorption: 0 to 0.5 percent maximum.
 3. Size and Shape: 2"x2".
 4. Thickness: 1/4 inch.
 5. Edges: Cushioned.
 6. Colors: As shown on drawings.
 7. Mounted Sheet Size: 12 by 12 inches (305 by 610 mm).
 8. Trim Units: Matching bead, cove, and surface bullnose shapes in sizes coordinated with field tile.
 9. Installation Method: Thin-Set.
 10. Grout: Epoxy
 11. Grout joint size: 1/8 inch.
- C. Porcelain Tile: Porcelain tile and trim shall be unglazed or glazed with the color extending uniformly through the body of the tile. Abrasive wear in accordance with ASTM C501 and bonding strength in accordance with ASTM C482. Moisture absorption in accordance with ASTM C373.
1. Manufacturer/Product: As shown on drawings.
 2. Size and Shape: As shown on drawings.
 3. Color: As noted on drawing.
 4. Installation Method: Thin-Set.
 5. Grout: Epoxy.
 6. Grout size: 1/16"

2.3 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Stainless Steel style and dimensions to suit application for use in the following locations as noted on drawings or per manufacturers recommendations.
1. Open edges of floor tile.
 2. Transition between floor finished of different heights.
 3. Thresholds at door openings.
 4. Expansion and control joints in floor and walls.

2.4 INSTALLATION MATERIALS

- A. Organic Adhesive: ANSI A136.1, thinset bond type; use type I in areas subject to prolonged moisture exposure, type II at other locations.
- B. Epoxy Adhesive: ANSI A118.3, thin set bond type.
- C. Mortar Bed Materials:
1. Portland Cement: ASTM C150, Type I or II.
 2. Hydrated Lime: ASTM C207, Type S.
 3. Sand: ASTM C144, fine.
 4. Cleavage and/or waterproof membrane as specified below.
 5. Latex additive: As approved.
 6. Water: Clean and potable.
- D. Mortar Bond Coat Materials:
1. Dry-Set Portland Cement type: ANSI A118.1
 2. Latex-Portland Cement Type: ANSI A118.4
 3. Epoxy: ANSI A118.3, 100 percent solids.
 4. Modified Epoxy Emulsion Mortar: ANSI A118.8
- E. Grout:
1. Epoxy Grout: ANSI A118.8, 100 percent solids epoxy grout; color as noted on drawings or selected from full range of manufacturers standard colors.

- F. Grout Sealer: Custom Building Products "Aquamix" Grout Sealer or prior approved equal.
- G. Silicone Sealant: Silicone sealant, moisture and mildew resistant type, match to field color; use for shower floors and shower walls.
- H. Moisture Barrier on Walls: As required for cleavage and to prevent penetration of small amounts of water, provide a system using No. 15 lb. Asphalt saturated felt and/or class B barrier paper complying with, ASTM D226, Type1.
- I. Waterproofing Membrane: Membrane in accordance with ANSI A118.10 as required to prevent passage of moisture.
- J. Reinforcing Mesh: 2 by 2-inch (50 by 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.
- K. Metal Lath: ASTM C847
- L. Cementitious Backer Board: High density, cementitious, glass fiber reinforced cementitious backer units complying with ANSI A118.9.
 - 1. 1/4 on countertops.
 - 2. 1/2 at walls.
- M. Movement (Expansion /Control) Joint Backing Material: Provide closed cell polyethylene foam (2.7 lbs/CF density), approximately 20 percent thicker than the width of the expansion joint.
- N. Movement (Expansion/Control) Joint Sealant: Provide in colors selected by Architect, complying with requirements of Section 07 9200, Joint Sealants.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive tile and report in writing with copy to Architect, detrimental conditions. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for corrections Architect may require.
- B. Test for moisture emission rate and alkalinity levels and confirm they are within the recommended limits set by the tile and setting materials manufacturer

3.2 PREPARATION

- A. Remove any curing compounds or other contaminates. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- C. Install tile backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners cover with skim coat of dry-set mortar to a feather edge.
- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

3.4 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions and TCNA Handbook recommendations.
- B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.
- C. Cut and fill tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instruction.
- G. Install stone thresholds where indicated.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep expansion joints free of adhesive or grout.
- J. Allow tile to set for a minimum of 48 hours prior to grouting.
- K. Grout shall be smooth and finished flush with the surface of the tile.
- L. Apply flexible sealant to junction of tile and dissimilar materials, expansion joints and junction of dissimilar planes.
- M. Apply grout sealer per manufacturer's directions after grout has cured 48 hours. Test for complete seal after two hours. If any water is absorbed, apply an additional coat.

3.5 INSTALLATION – FLOORS – THIN-SET METHODS

- A. Over exterior concrete substrates, install in accordance with TCNA Handbook Method F102, with standard grout.
- B. Over interior concrete substrates, install in accordance with TCNA Handbook Method F113, dry-set or latex-Portland Cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, install in accordance with TCNA handbook method F122, with latex-Portland Cement grout.
 - 2. Where epoxy bond coat and grout are indicated, install in accordance with TCNA Handbook Method F131.
- C. Over wood substrates, install in accordance with TCNA Handbook Method F142, with standard grout, unless otherwise indicated.
 - 1. Where epoxy bond coat and grout are indicated, install in accordance with TCNA Handbook Method F143.

3.6 INSTALLATION – WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA handbook Method W244, using membrane at toilet rooms.
- B. Over cementitious backer units install in accordance with TCNA handbook method W223, organic adhesive.
- C. Over gypsum wallboard on wood or metal studs install in accordance with TCNA handbook method W243, thin-set with dry-set or latex-Portland Cement bond coat, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCNA handbook method W222, one coat method.
- D. Over interior concrete and masonry install in accordance with TCNA handbook method W202, thin-set with dry-set or latex-Portland Cement bond coat.

3.7 EXTRA MATERIALS

- A. Provide one (1) square foot of tile for each one hundred (100) square feet of each color and size of tile and grouting materials used in the Project. If less than 100 square feet is installed, provide a minimum of one square foot of extra stock.

3.8 CLEANING AND PROTECTION

- A. Clean tile and grout surfaces. Cover floors and protect from damage, dirt and residue from other trades.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 5100

ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Acoustical Ceilings as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. ASTM C635 - Standard Specification for Acoustical Tile and Lay-In Panel Ceilings"
- B. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels"
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions"
- D. ASTM E84 - Surface Burning Characteristics of Building Materials
- E. Ceilings and Interior Systems Construction Association (CISCA) Ceiling Systems Installation Handbook
- F. IBC - Section 1613
- G. American Society of Civil Engineers; Current ASCE Standard: "Minimum Design Loads for Buildings and Other Structures"
- H. Ceilings and Interior Systems Construction Association (CISCA) – Guidelines for Seismic Restraint of Direct Hung Suspended Ceiling Assemblies in Seismic Zones 0-2

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Standard: Where required by local code, provide acoustical tile ceilings designed and installed to withstand the effect of earthquake motions (as determined according to ASCE/SEI 7) according to the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580.
 - 2. Engage a qualified professional engineer to design seismic restraints for ceiling systems where required.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 - 1. Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from a single manufacturer.

- B. Applicators shall be approved by manufacturer for the system being installed.

1.5 WARRANTY

- A. Acoustical Panel: submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within ten (10) years. Failures include, but are not limited to:
 - 1. Acoustical Panels: Sagging, warping or supporting the growth of mold.
 - 2. Grid System: rusting and manufacturer's defect.

1.6 SUBMITTALS

- A. General: Submittals requirements are specified in Section 01 3300, Submittal Procedures.
- B. Shop Drawings: Show typical layout of systems including attachments, intersections of members and edge conditions.
- C. Product Data: Submit data for each type of unit specified herein.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, acoustical ceiling products shall be products of one of the following manufacturers, subject to compliance with specification requirements.
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation

2.2 MATERIALS

- A. General:
 - 1. Exposed faces of main and cross runners shall be a baked enamel paint finish (unless indicated otherwise).
 - 2. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
 - 3. Wall moldings to be 24 MSG painted steel, finish and configuration to match grid.
 - 4. Provide "access-type" hold-down clips at entrance vestibules and where recommended by acoustical ceiling manufacturer for type and condition where panels weigh less than one pound per square foot.
 - 5. Ceiling suspension systems shall be "heavy duty" type.
 - 6. Hanger wire shall be annealed galvanized steel conforming to ASTM A641, Class 1, and not less than 12 gauge.
- B. System #1 (non fire-rated):
 - 1. Suspension system shall be equal to:
 - a. Armstrong Ceiling Systems: Prelude 15/16"
 - 2. Panels shall be equal to:
 - a. Armstrong "Dune", Item No. 1774HRC
 - b. 24 inch x 24 inch x 5/8 inch
 - c. Angled tegular edge
 - d. Matte white

2.3 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled bonded anchors.
 - b. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch diameter bolts.
- E. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.
- F. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and conditions including structural framing to receive Work and report in writing any conditions detrimental to Work. Commencement of Work will be construed as acceptance of subsurface. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Work hereunder requires coordination with other work that connects with, is affected or concealed by acoustical units. Before proceeding with Work, make certain required inspections have been made.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Suspension System:

1. Install all components in compliance with ASTM C636, "Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels".
2. Installation shall be braced against seismic upset where required by applicable code in compliance with ASTM E580/E580M, "Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions".
3. Suspend main runners from structure above, at 48 inches on center and accurately leveled and securely fastened to structure in a manner approved by the ceiling system manufacturer and in compliance with all governing codes.
4. Provide additional hanger wires and supports in grids as required where mechanical items, projection screens, lighting fixtures, and other loads scheduled for installation directly to the ceiling system with a safety factor of 4.0 minimum.
5. Provide main grid tees along edges of mechanical and lighting fixtures supported by the grid.
6. Surface-mounted lights shall be suspended from structure above by not less than (2)12 gauge galvanized steel wires.
7. No section of main runner shall be less than 48 inches long nor be supported by less than 2 hanger wires.
8. Main runners may not be supported by wall angle. Support main runners no further than 12 inches from wall with hanger wire.
9. All exposed members shall be butted at intersections, not lapped.
10. Inside and outside corners of wall angle to be mitered.
11. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.3 INSTALLATION - ACOUSTICAL PANELS

- #### A. Lay-in panels shall be placed on flange supports of suspension system and be fully seated on all edges.
- #### B. Cut acoustical units as required to fit grid of suspension system. Route edges of field-cut tegular units and paint all exposed edges.
1. Install hold-down and seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
 2. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

3.4 ERECTION TOLERANCES

- #### A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet.
- #### B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet.

3.5 MAINTENANCE STOCK

- #### A. Provide an additional 2 full cartons of each type of acoustical tile installed in unopened cartons to the Owner at the completion of Work.

3.6 CLEANING

- A. Replace damaged tees, runners or wall angles. Remove damaged or soiled panels and replace with new units.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes the manufacture and installation of Resilient Flooring and accessories as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. RFCI - Resilient Floor Covering Institute
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- C. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing
- D. ASTM F1344 - Standard Specification for Rubber Floor Tile

1.3 QUALITY ASSURANCE

- A. Qualifications: Installation shall be by an approved qualified installer and shall be in strict accordance with manufacturer's printed directions and recommendations.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit two (2) copies of manufacturer's recommended procedures for resilient flooring installation, including types of adhesives prior to commencement of Work.
- C. Shop Drawings:
- D. Product Data: Resilient flooring and all accessories.
- E. Samples: Submit two (2) samples of each material specified herein for approval prior to ordering of materials

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically prior approved by the Architect, resilient flooring shall be products of one of the following manufacturers, subject to compliance with specification requirements.
 - 1. Tarkett
 - 2. Mannington Commercial
 - 3. Armstrong World Industries

2.2 MATERIALS

- A. Luxury Vinyl Tile (LVT)
 - 1. See drawings for selected materials.

2.3 ACCESSORIES

- A. Adhesives: Shall be as recommended by the manufacturer of the flooring materials for the underfloor substrate conditions involved. Adhesives shall be waterproof, stabilized type. Solvent based asphalt emulsions are not acceptable.
- B. Crack and Joint Filler: Shall be as recommended by the manufacturer for the application anticipated.
- C. Edging and Merging Strips: Refer to Section 09 6513, Resilient Base and Accessories and Drawings.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Requirements: Installation shall not begin until the work of other trades is substantially completed and the area or rooms where flooring is to be installed has been maintained at a minimum temperature of 70 degrees F for at least 48 hours.
- B. Moisture content and Ph level of concrete sub-floors shall not exceed flooring or flooring adhesive manufacturer's requirements as determined by an established field test method.

3.2 EXAMINATION

- A. Field Measurements: The Contractor shall verify quantities by making field measurements where resilient material is specified. No additional costs to the Owner will be allowed for failure to verify actual built measurements or for failure by the Contractor to accurately determine the actual quantities of material required for the complete installation
- B. Verification of Conditions: Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- C. Do not lay floor covering until sub-floors are in proper condition to receive same. Sub-floors shall be broom clean, free of foreign matter and thoroughly clean before installation.

3.3 PREPARATION

- A. Ridges shall be ground smooth. Fill holes and cracks less than 1/16-inch with approved plastic material. Cracks 1/16 inch or wider shall be cut out and filled with a non-shrinking cement mortar. Chalky or dusty surfaces shall be primed with a primer as recommended by the floor covering manufacturer. Scrape entire floor surface to remove wax, litter and telegraphing defects.
- B. Fill joints, cracks, chips and low areas in sub-floor using crack filler or underlayments as required. Provide a true, even surface to receive flooring. Smooth walls with underlayment as required where they are to receive flooring/base materials.
- C. Tests for moisture and alkalinity must be conducted prior to installation of flooring materials in accordance with manufacturer's acceptable testing practices. Flooring products shall be

installed only after moisture and Ph levels are within acceptable limits as determined by the flooring manufacturer.

3.4 INSTALLATION

- A. Floor coverings and accessories shall be applied in accordance with the approved installation procedure and manufacturer's printed instructions.
 - 1. Layout flooring seams as indicated on approved submittal. In no case shall seams run through doorways, passages, etc. in the direction of travel.
 - 2. Adhesives shall be applied in accordance with the adhesive manufacturer's printed directions unless specified or directed otherwise.
 - 3. Floor covering shall be cut to and fitted around permanent fixtures, built-in furniture and cabinets, pipes and outlets.
 - 4. Metal edging shall be provided where floor covering terminates at points higher than the contiguous finished flooring except at doorways where thresholds are provided. The strips shall be anchored to concrete floors with counter-sunk screws into metal or fiber expansion sleeves.
 - 5. Install floor material to toe kick of cabinet or under counter to wall.
 - 6. Install floor material below thresholds and/or to centers of doorways where transitions occur.
- B. Installation of Vinyl Composition Tile (VCT), Luxury Vinyl Tile (LVT) and Rubber Tile
 - 1. Floor covering shall be applied square with the room axis, starting in the center of the room or area, and working from the center towards the edges or borders.
 - 2. Joints shall be square, symmetrical, tight and even, and each floor shall be in a true, level plane except where indicated as sloped. Borders shall be cut, fitted and scribed to walls and partitions.
 - 3. Unless otherwise shown on the Drawings VCT shall be laid with pattern grain running in the same direction (not checker-board) and tile shall be laid in conventional square corner to corner pattern. Verify with the Architect prior to installation the floor layout and directional grain.
- C. Merging strips, edgings and trim shall be installed as shown on the Drawings, or in location necessary to complete the installation of the floor coverings.

3.5 MAINTENANCE MATERIALS

- A. Extra Materials: Provide the following quantity of materials for each type or color installed to the Owner, at no additional cost:
 - 1. Luxury Vinyl Tile: Provide one unopened carton of each color floor tile.

3.6 CLEANING AND PROTECTION

- A. Keep traffic to an absolute minimum until flooring has become well seated. Under no conditions shall fixtures, equipment, trucks, etc. be allowed on flooring until seated.
- B. Avoid routine rolling loads in newly seamed areas for 48 hours following seaming.
- C. After flooring has become well seated thoroughly clean in accordance with manufacturer's recommendations.
- D. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 6513

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Resilient Base and Accessories including systems for transitions between differing floor finishes.

1.2 SUBMITTALS

- A. General: Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit manufacturer's technical data, application instructions, and general recommendations.
- C. Drawings: For custom products and transitions other than standard manufactured products, submit detail drawings showing relationship of materials for transitions.
- D. Samples: Submit two (2) 2-1/2" x 4" samples in colors indicated on Drawings. If color is not indicated submit manufacturer's full line of colors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically prior approved by the Architect, resilient base and transitions shall be products of one of the following manufacturers, subject to compliance with specification requirements.
 - 1. Tarkett
 - 2. Flexco
 - 3. Roppe
 - 4. Burke
- B. Resilient Base:
 - 1. Size: 4 inches high, in continuous roll.
 - 2. Material: 100% rubber
 - 3. Style: cove
 - 4. Color: as noted on drawings.
- C. Transition strip systems
 - 1. As indicated in schedule.
- D. Accessory Materials
 - 1. Adhesive
 - a. Type as recommended by manufacturer for material and substrate.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with manufacturer's requirements for temperature, moisture, humidity, ventilation and other conditions required to execute and protect work.

3.2 EXAMINATION

- A. Examine the areas and conditions where floor transitions are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Perform preparation and cleaning procedures according to manufacturer's instructions for particular substrate conditions involved, and as specified. Wall and floor surfaces shall be completely dry.
- B. Cracks and voids in the wall shall be filled with approved filler materials.
- C. Clean wall surfaces to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents.

3.4 INSTALLATION

- A. Installation of resilient base:
 - 1. Resilient base shall be applied after flooring has been completed and the wall surface, to which the base is to be applied is thoroughly dry.
 - 2. Base adhesive shall be applied to the back of the base with a notched trowel, leaving approximately 1/4 inch bare space along the top edge of base.
 - 3. The base shall immediately be pressed firmly against the wall and moved gently into place, making sure that the toe is in contact with the floor and the wall.
 - 4. The entire surface of the base shall be rolled with a hand roller, and then the toe of the base shall be pressed firmly against the wall with a straight piece of wood.
 - 5. The base shall be installed with a minimum number of splices.
 - 6. Cove base used in carpeted area shall be set over top of carpeting.
 - 7. Inside corners shall be lightly scored on backside of base material, install as one continual piece at least 12 inches beyond corner in either direction.
 - 8. Outside corners shall be lightly scored and formed around corner in one integral piece without any butt joints.
 - 9. Do not apply rubber base over non-porous surfaces such as, but not limited to vinyl wallcovering, plastic laminate or steel. Install per manufacturer's recommendations.
- B. Installation of transition systems:
 - 1. Unless shown and dimensioned on drawings or directed by Architect, locate flooring transitions as follows:
 - a. At doors: centered under door in closed position.
 - b. Wall openings other than doors: thicker flooring line coincides with outside face of partitions.
 - c. Moveable partitions and coiling doors: thicker flooring line coincides with inside face of fixed partitions.
 - d. Transitions not at doors or in line with walls:
 - (1) Substrate for thicker flooring will be recessed or underlayment shall be installed below thinner flooring to allow surface alignment between adjacent flooring materials.
 - (2) Adjacent flooring materials shall butt together without additional transition product.
 - (3) Apply each floor transition according to manufacturer's directions to produce a uniform flooring surface of thickness indicated.

- (4) Primer (Bond coat): Apply bond coat over prepared substrate at manufacturer's recommended spreading rate.

3.5 TRANSITION SYSTEM SCHEDULE

- A. Luxury Vinyl Tile composition tile or to carpet:
 - 1. Equal to Tarkett "CTA-H"
- B. Luxury Vinyl Tile composition tile, to sealed concrete:
 - 1. Equal to Tarkett "SSR-B"
- C. Luxury Vinyl Tile composition tile or resilient sheet flooring to rubber flooring:
 - 1. Equal to Tarkett "CTA-X"
- D. Porcelain and ceramic tile to concrete:
 - 1. Equal to Tarkett "CTA-P"
- E. Porcelain and ceramic tile to carpet:
 - 1. Equal to Schluter "Reno".
- F. Carpet to sealed concrete:
 - 1. Equal to Tarkett "CTA-J"

3.6 MAINTENANCE MATERIALS

- A. Extra Materials: Provide the following quantity of materials for each type or color installed to the Owner, at no additional cost:
 - 1. Resilient base: one 16' piece.

3.7 PROTECTION AND CLEANING

- A. Cover traffic routes across completed floor transitions with plywood, hardboard, or other durable material to protect against damage. Keep traffic to an absolute minimum until flooring has become well seated.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 6813

TILE CARPETING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of Tile Carpeting and accessories as shown on Drawings and as specified herein. Refer to Section 09 6513, Resilient Base and Accessories for resilient wall base and accessories installed with carpet tile.

1.2 REFERENCES

- A. CRI - Carpet and Rug Institute
- B. SCAQMD -South Coast Air Quality Management District
- C. ASTM D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- F. ANSI/NSF 140 - Sustainability Assessment for Carpet

1.3 QUALITY ASSURANCE

- A. Carpet Installer shall have a minimum of five (5) years commercial installation experience:
- B. Mock up: Provide mockup for approval by the architect of special cuts/effects such as mitered corners at borders or graphic patterns that are prepared and installed onsite.

1.4 WARRANTY

- A. Warranty: The following warranty shall be submitted to the Owner in addition to the Warranty described in Section 01 7700, Closeout Procedures.
- B. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: Ten (10) years from date of Substantial Completion.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit manufacturer's recommended procedures for installing carpet, adhesive and accessories, at least sixty (60) days prior to commencement of work.
- C. Sustainable Design Submittals:
 - 1. Product Data: For adhesives and sealants indicating compliance with General Emissions evaluation and VOC content requirements.
 - 2. Product Data: For flooring products indicating compliance with General Emissions evaluation
 - 3. Building Product Disclosure Requirements: To encourage the use of building products that are working to minimize their environmental and health impacts, provide the following information when available:
 - a. Environmental product Declarations:
 - b. Material Ingredients –Documentation demonstrating the chemical inventory of the product to at least 0.1% (1000ppm).
 - 4. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.
- D. Shop Drawings: Within thirty (30) days after Award of Contract, submit the following:
 - 1. Carpet manufacturer's acknowledgment of receipt of order.
 - 2. Submit manufacturer's Shop Drawings indicating carpet tile layout, installation method and patterning.
- E. Samples: Submit two (2) carpet tile samples in each style and color specified. Provide the following information for each carpet sample submitted:
 - 1. Name of manufacturer.
 - 2. Name/pattern of carpet.
 - 3. Manufacturers published specification for Sample.
- F. Quality Control Submittals:
 - 1. Labeling: A label meeting the Federal Labeling Requirements, as stated in the Textile Products Identification Act under the Federal Trade Commission, shall be attached to the certification samples and the products delivered.
 - 2. Furnish carpet tile from one dye lot only for each color-way per floor.
 - 3. Certificates: Certification that submitted samples comply with specifications on manufacturer's letterhead and signed by an officer of manufacturing company.
- G. Contract Closeout Submittals: Submit the following in accordance with Section 01 7700, Submittal Procedures.
 - 1. Operating and Maintenance: Furnish carpet care, cleaning, and maintenance instructions.
 - 2. Certificate of flame spread rating for each type of carpet.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Building Product Disclosure Requirements: Provide Building Product Disclosure documentation for products used in this section when available.
 - 1. Environmental product Declarations:
 - 2. Material Ingredients –Documentation demonstrating the chemical inventory of the product to at least 0.1% (1000ppm).

- B. Low-emitting requirements – Adhesives and Sealants:
 - 1. General Emissions Evaluation: Adhesives and Sealants must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
 - 2. VOC Content Requirements for Wet Applied Products: All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, amended October 26, 2017, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.
 - 3. Methylene chloride and perchloroethylene shall not be intentionally added in paints, coatings, adhesives, or sealants.
 - 4. Do not use adhesives that contain urea formaldehyde.
 - 5. Show compliance with VOC limits as detailed in Section 01 8116 “VOC Limits”
- C. Low-emitting requirements – Flooring:
 - 1. General Emissions Evaluation: Flooring products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario.
 - 2. Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.
 - 3. Sustainable Product Certification: Gold level certification according to ANSI/NSF 140.

2.2 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by Architect, carpet and accessories shall be products of one of the following manufacturers, subject to compliance with specifications requirements.
 - 1. Tarkett
 - 2. Interface
 - 3. Mohawk
 - 4. Shaw

2.3 MATERIALS

- A. Carpet Tile:
 - 1. See drawings for selected materials.

2.4 ACCESSORIES

- A. Underlayment: Portland cement-latex concrete floor filler for leveling concrete floor as recommended by carpet manufacturer.
- B. Termination Strips: Metal or vinyl reducer strips as required in areas, doorways and other areas where edge of carpet is exposed.
- C. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 EXECUTION

3.1 PROJECT CONDITIONS

- A. Environmental Requirements: Installation shall not begin until the work of other trades is substantially completed and the area or rooms where flooring is to be installed has been maintained at a minimum temperature of 70 degrees F for at least 48 hours.
- B. Moisture content and Ph level of concrete sub-floors shall not exceed flooring or flooring adhesive manufacturer's requirements as determined by an established field test method.

3.2 EXAMINATION

- A. The Contractor shall be responsible for determination of quantities required under the specified scope of work to furnish an acceptable tailored installation with tuft rows of yarn running in the same direction. The Contractor shall verify quantities by making field measurements.
- B. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- C. Coordinate with other work that affects, connects with or will be concealed by this Work.
- D. Concrete Slabs: Verify that conditions comply with requirements specified by the carpet manufacturer and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

3.3 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Surface Preparation:
 - 1. Inspect surfaces to receive carpet, make tests recommended by carpet manufacturer, take corrective action deemed necessary and/or notify Architect in writing of condition(s) that could be detrimental to carpet installation.
 - 2. Prepare floor as required by the carpet manufacturer prior to installing carpet.
 - 3. Grind ridges in concrete floors level and smooth.
 - 4. Fill cracks, construction joints and other surface imperfections with latex underlayment compound applied level with adjacent surfaces.
 - 5. Remove foreign and incompatible materials and vacuum clean surfaces immediately prior to installation. Telegraphing of irregularities in the subfloor shall be sufficient cause for rejection.

3.4 INSTALLATION

- A. Comply with CRI 104- Standard for Installation Specification of Commercial Carpet, "Carpet Modules" section and carpet tile manufacturer's written instructions, except where more stringent requirements are shown or specified and where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
 - 1. Unless otherwise noted or approved on drawings, begin laying tile at centerline.
 - 2. Comply with carpet tile instructions for direction of carpet tile. Unless otherwise noted on drawings align pattern and pile in the same direction, parallel to the centerline of the area or room.
 - 3. Extend carpet tile under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.
 - 4. Install carpet edge guard where edge of carpet is exposed; anchor guards to substrate. Use full-length strips only.
 - 5. Do not bridge building expansion joints with carpet tile; provide for movement.
 - 6. Carpet tile shall be free from movement when subjected to traffic.
 - 7. Do not use pieces smaller than 1/3 of a standard tile without prior approval.
 - 8. Where floor material changes place centerline of abutting materials below door.
 - 9. Partial glue-down installation: install tiles with releasable, pressure-sensitive adhesive.
- B. Self-adhesive installation: Install per manufacturer's recommendation.
- C. Stairway Carpeting: Install per manufacturer's recommendation. Provide vinyl nosing at each riser. Match adjoining carpet installation.
- D. Install rubber base after completion of carpet work. Use adhesive recommended by rubber base manufacturer.

3.5 MAINTENANCE MATERIALS

- A. Provide a quantity equal to 1% of the total installed material up to a total of 200 SF but no less than 30 SF for each color/style.

3.6 CLEANING AND PROTECTION

- A. Remove spots, smears, stains, and similar defects immediately with a material recommended by carpet manufacturer. Thoroughly vacuum and clean the carpet installation. Spots shall be cleaned with the spot remover approved by the carpet manufacturer and loose threads removed.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 8100
ACOUSTIC INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of fiberglass Acoustic Insulation as shown and as specified herein.

1.2 REFERENCES

- A. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
- B. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- C. ASTM E136 – Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C
- D. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- E. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- F. ASTM C1304 – Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials
- G. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit technical data sheets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein or specifically approved by Architect, acoustical insulation shall be the products of one of the following manufacturers subject to compliance with specification requirements.
 - 1. Certainteed
 - 2. Johns-Manville
 - 3. Knauf Insulation
 - 4. Owens Corning Fiberglas

2.2 MATERIALS

- A. Sound Attenuation Batt: Formaldehyde free, 3-1/2 inch nominal Sound Attenuation Batt insulation complying with ASTM C665, Type 1 and ASTM C1304 (Odor Emission) and ASTM C1338 (Fungi Resistance). Insulation shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84.
- B. Thickness of batts shall match the nominal wall thickness into which it is installed.
- C. Sound Attenuation Batts used above ceilings shall be 6" thick.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install acoustical insulation batts in stud partition walls where indicated. Batts shall be sized for a friction fit and shall be installed in a continuous manner, as per manufacturer's recommendations with no gaps or voids.
- B. Install acoustical insulation batts above lay-in ceilings, where indicated, in strict accordance with manufacturer's printed instructions.

3.2 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 09 9100
PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Furnish and apply Paint and Coatings as specified herein and as noted on Drawings.

1.2 DEFINITIONS

- A. Gloss Level 1 (Flat): Not more than 5 units at 60 degrees and 1 to 2 units at 85 degrees.
- B. Gloss Level 2 (Velvet): 5 to 9 units at 60 degrees and 10 to 15 units at 85 degrees.
- C. Gloss Level 3 (Eggshell): 10 to 15 units at 60 degrees and 15 to 30 units at 85 degrees.
- D. Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and 35 to 50 units at 85 degrees.
- E. Gloss Level 5 (Semi-Gloss): 40 to 50 units at 60 degrees.
- F. Gloss Level 6 (Gloss): 70 to 80 units at 60 degrees.
- G. Gloss Level 7 (High-Gloss): More than 80 units at 60 degrees.

1.3 SUBMITTALS

- A. General: Submittals requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Before submitting samples, submit a complete schedule of manufacturers of products required throughout the Work, together with specifications recommended by each manufacturer. General approval of such a schedule shall not constitute a waiver of the specifications and Architect may require specific guarantees from a manufacturer regarding his product.
- C. Samples: Submit samples of each type of finish specified herein.
 - 1. Submit two 8 inch x 10 inch "draw down" samples of each color, indicating the correct sheen and texture. Submit sealer and stain finishes on material of the same quality and species of wood on which that particular finish shall be used. Rejected samples shall be resubmitted until approved. Samples shall be submitted at least thirty (30) days prior to the start of painting work. Label and identify each sample as to location and application. Upon submittal of color samples, minor variations or changes in color selection may be requested by the Architect and new samples ordered, until final color approval.
 - 2. At the Architect's request, the final sample of each color approved by the Architect shall be an actual in-place application of each color on a designated wall, ceiling or other surface to receive each particular color or finish. Upon completion of the sample area, minor variations in the color selection may be made by the Architect and new samples ordered until final in-place color approval. Contractor should anticipate one such repainting of each sample area.

1.4 QUALITY ASSURANCE

- A. Preparation, application, and workmanship shall be in accordance with manufacturer's recommendations and applicable provisions of MPI, by the Painting and Decorating Contractors of America (PDCA) and the "Gypsum Board for Walls and Ceilings" booklet by the Gypsum Association.
- B. Materials used shall comply with applicable federal and local regulations, lead content laws, and current V.O.C. requirements.
- C. Perform work using only experienced, competent painters under supervision of experienced, capable foremen, per PDCA with the best standards of practice in the trade. When completed, the painting shall represent a first-class workmanlike appearance. Apply paint materials under adequate illumination.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's sealed containers, legends and labels, intact.
- B. Storage and Protection: Store paint products in covered, ventilated area at minimum ambient temperature of 45 degrees F. and maximum ambient temperature of 90 degrees F.

1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Do not apply exterior paint in damp or rainy weather or until after the surface has dried thoroughly from the effects of such weather. Do not apply when temperature is below 50 degrees or above F., 100 degrees 24 hours before, during and 24 hours after application. Do not paint surfaces exposed to hot sunlight. During interior application, maintain minimum temperature of 65 degrees F.

1.7 MAINTENANCE

- A. Extra Materials: Furnish Owner with one fresh gallon of each type and color of paint and finish used on this Project. Label each gallon with the following information: Manufacturer's name, type of coating, brand name, lot number, estimated coverage, surface preparation requirements, drying time, cleanup instructions, color designation and instructions for mixing. Mark each container with the location(s) where the paint was used, without obscuring manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically approved by the Architect, Paint and Coating Products shall be of the following manufacturers, subject, however, to compliance with specification requirements.
 - 1. BEHR
 - 2. Benjamin Moore Paints
 - 3. Frazee Paint Company
 - 4. Dunn-Edwards Corporation
 - 5. Glidden Professional (PPG)
 - 6. Olympic Paints and Stains
 - 7. PPG Paints
 - 8. Sherwin Williams

9. Kelly-Moore
 10. Rustoleum
- B. Materials shall be "top of the line, first quality" products. Alternate materials submitted for prior approval shall have qualities and materials equal to the other listed manufacturer's top of the line, first quality products. Materials selected for coating systems for each type of surface shall be the products of a single manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that site environmental conditions are appropriate, and substrates are in proper condition to receive Work and report in writing with a copy to Architect, conditions detrimental to Work. Commencement of Work will be construed as acceptance of substrates.
- B. Verify that shop applied primers are compatible with specified finish coats.
- C. Do not begin application of coatings unless moisture content of surfaces is below the following maximum values:
1. Gypsum and plaster surfaces: 12 percent.
 2. Masonry surfaces: 8 percent.
 3. Wood surfaces: 8 percent.
 4. Vertical concrete surfaces: 12 percent.
 5. Horizontal concrete surfaces: 8 percent.

3.2 PREPARATION

- A. Protection: Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection for such items.
1. Protect adjacent surfaces as required or directed.
 2. Prepare surfaces in strict accordance with manufacturer's written instruction.
- B. Surface Preparation:
1. General: Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, grease, oil and other foreign matter. Repair voids, cracks, nicks, and other surface defects, with appropriate patching material. Finish flush with surrounding surfaces.
 2. Wood: Sandpaper to smooth and even surface and then dust off. After primer or clear sealer coat has been applied, thoroughly fill nail holes and other surface imperfections. Sand woodwork between coats to a smooth surface. Cover knots and sap streaks with a thin coat of shellac. Wood trim shall be back-primed before installation. Door and window edges shall be finished after final fitting.
 3. Steel and Iron: Remove grease, rust and scale and touch-up chipped or abraded places on items that have been shop coated. When area will be exposed to view, sandpaper the entire treated area smooth and spot prime in a manner to eliminate evidence or repair.
 4. Galvanized metal or aluminum: Thoroughly clean by wiping surfaces with surface conditioner or solvent. Prime galvanized metal with primer as recommended by paint manufacturer.
 5. Concrete: Prepare surfaces to be painted by removing dirt, dust, oil and grease stains and efflorescence in accordance with manufacturers recommendations. Fill holes, cracks, etc. with suitable fill material.
 6. Gypsum board: Prior to applying texture to gypsum wallboard surfaces to receive a paint finish, one coat of polyvinyl acetate (PVA) wall primer/sealer shall be

applied. Color of the primer/sealer shall be tinted to a color to contrast with the texturing material(s). The primer/sealer application shall be coordinated with the wallboard subcontractor as necessary and confirmed per the joint and texturing material's manufacturer's recommendation.

7. Concrete and Brick Masonry: Prepare surfaces to be painted by removing dirt, dust, oil and grease stains and efflorescence in accordance with manufacturers recommendations. Unless noted otherwise, all interior and exterior concrete masonry units (C.M.U.) to receive block filler to "level 2" fill classification. An elastomeric type coating shall then be applied to the top and inside face of all parapet walls overlapping the roof base flashing.
 8. Existing Surfaces: Clean, sand, patch, repair, and prepare existing surfaces to be repainted so that such existing finished surfaces are indistinguishable from "new" surfaces.
- C. Claims concerning suitability of material specified (or its inability to satisfactorily produce the work) shall not be accepted unless such claim is made in writing to the Architect prior to beginning the work. Surfaces that cannot be prepared or painted as specified shall be immediately brought to the attention of the Architect in writing.

3.3 APPLICATION

- A. Prime coats specified herein will not be required on items delivered with prime or shop coats already applied, unless otherwise specified. Touch up prime coats as required.
- B. Paint all exposed Plumbing, mechanical and electrical items: Paint exposed unfinished fixtures, metal ducts, switch boxes, control panels, devices, starters, junction boxes, vents, drains, and other similar items on roof or other exterior locations unless otherwise directed by Architect. Color code and stencil identification when specified.
- C. Apply coatings without reduction except as specifically required by label directions.
- D. Grilles and registers paint to match walls and ceilings. Throats of ducts where visible shall be given one coat of flat black paint.
- E. Access panels (except stainless steel) and other similar items, shall be painted to match adjacent surfaces.
- F. Factory finished items: Architect may require repainting of exposed-to-view factory finished items to coordinate with the colors scheduled for the location in which item occurs. Contractor shall verify with Architect the need to repaint factory finished items.
- G. Each coat of paint shall be well applied, worked out evenly and allowed to dry completely before the subsequent coat is applied. Comply with more stringent manufacturer's drying requirement, as applicable.
- H. Finished work shall be uniform, smooth and free from runs, sags, clogging or flooding. Make edges of paint adjoining other materials or colors sharp and clean, without overlapping.
- I. Edges, tops, and bottoms of wood doors shall be finished and sealed with the same finish as the door faces, to meet door manufacturer's warranty requirements.
- J. Do not paint over Underwriters' Laboratory labels, fusible links, sprinkler heads, and other similar items.

- K. Finish closets and the interior of cabinets with same color as adjoining rooms, unless otherwise specified. Finish other surfaces same as nearest or adjoining surfaces, unless otherwise shown or scheduled.
- L. Paint surface of walls that will be concealed by cabinets, markerboards or other items attached to wall.

3.4 CLEANING AND PROTECTION

- A. During the course of the Work and on completion of Work, carefully clean glass, hardware, and other similar items, and remove misplaced paint and stain spots or spills. Leave Work in clean condition acceptable to Architect and in accordance with Section 01 5000, Temporary Facilities and Controls.
- B. Protect from damage until acceptance. Repair or repaint damaged Work at no additional cost to Owner.

3.5 SCHEDULES

- A. Schedule of Finishes: Refer to the "Finish Plan" on the Drawing for designated finishes of areas that are listed in accordance with the following schedule.
 - 1. Items listed are acceptable as "basis of design" products of Glidden Professional (PPG). Other manufacturers shall furnish equal types of materials. Responsibility for recommending, scheduling and using the proper paint for the job conditions rests with the manufacturer and Contractor.
- B. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied, at no additional cost to the Owner, to completely hide base material, provide uniform color and to produce satisfactory finish results.
- C. Apply products to achieve paint manufacturer's printed specifications for dry mil thickness
- D. Exterior Surfaces:
 - 1. Concrete - Flat (Acrylic):
 - 1st Coat: 4-603XI Perma-Crete Alkali-Resistant Primer Sealer, MPI #3
 - 2nd Coat: 6-610XI Speedhide Acrylic Flat (Gloss Level 1), MPI #10
 - 3rd Coat: 6-610XI Speedhide Acrylic Flat (Gloss Level 1), MPI #10
 - 2. Plaster and stucco - Flat (Acrylic):
 - 1st Coat: 4-603XI Perma-Crete Alkali-Resistant Primer Sealer, MPI #3
 - 2nd Coat: 6-610XI Speedhide Acrylic Flat (Gloss Level 1), MPI #10
 - 3rd Coat: 6-610XI Speedhide Acrylic Flat (Gloss Level 1), MPI #10
 - 3. Ferrous Metal - Semi-Gloss Acrylic:
 - 1st Coat: Rust-Oleum Mathys Noxyde- at 7 mils DFT
 - 2nd Coat: Rust-Oleum Mathys Noxyde- at 7 mils DFT
 - 3rd Coat: Rust-Oleum Sierra Performance Metal Max Plus - -3 mils DFT
 - 4. Ferrous and non-ferrous metal; High-Gloss (Two component siloxane coating):
 - 1st Coat: PPG PSX 700
 - 2nd Coat: PPG PSX 700
 - Coating shall be applied to a 7.0 mil DFT

E. Interior Surfaces:

1. Gypsum Wallboard – Flat (Acrylic): At Ceilings
1st Coat: 1030 Prep & Prime PVA Interior Primer-Sealer after texturing
2nd Coat: 1210 Ultra-Hide 150 Latex Flat
2nd Coat: 1210 Ultra-Hide 150 Latex Flat
2. Gypsum Wallboard - Eggshell (Acrylic):
1st Coat: 1030 Prep & Prime PVA Interior Primer-Sealer after texturing
2nd Coat: 1402 Ultra Hide 250 Latex Enamel (Gloss Level 3) MPI #44
3rd Coat: 1402 Ultra Hide 250 Latex Enamel (Gloss Level 3) MPI #44
3. Plaster - Eggshell (Acrylic):
1st Coat: 1030 Prep & Prime PVA Interior Primer-Sealer
2nd Coat: 1402 Ultra Hide 250 Latex Enamel (Gloss Level 3) MPI #44
3rd Coat: 1402 Ultra Hide 250 Latex Enamel (Gloss Level 3) MPI #44
4. Metal - Two Component Water Reducible Epoxy:
1st Coat: PPG Aquapon WB Epoxy Primer 98-46
2nd Coat: PPG Aquapon WB Water Based Epoxy 98-1
3rd Coat: PPG Aquapon WB Water Based Epoxy 98-1
5. Concrete slab scheduled to receive “Sealer” as a finish:
1st Coat: PPG Paints Perma-Crete Plex Seal Concrete Sealer 4-6200XI
2nd Coat: PPG Paints Perma-Crete Plex Seal Concrete Sealer 4-6200XI

END OF SECTION

SECTION 10 1100

VISUAL DISPLAY SURFACES

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install Visual Display Surfaces as shown on Drawings and as specified herein.

1.2 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Shop Drawings: Submit Drawings of visual display surfaces showing method of construction and mounting techniques.
- C. Submit color samples and trim for color selection from manufacturer's standard colors.
- D. Submit the following in accordance with Section 01 7700, Closeout Procedures.
 - 1. Submit two (2) copies of manufacturer's printed maintenance instructions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or prior approved by the Architect, visual display surfaces shall be products of one of the following manufacturers, subject to compliance with specification requirements.
 - 1. Claridge Products and Equipment Inc.
 - 2. Best-Rite Chalkboard Company
 - 3. Nelson-Adams Co.
 - 4. PolyVision

2.2 TACKABLE WALL PANELS

- A. Tackable wall panels shall be vinyl-covered tackable wall panels meeting the following requirements. Sizes shall be shown on Drawings with wrapped beveled edges.
 - 1. Base board shall be minimum 7/16 inch cellulose fiber board or approved equal conforming to the following requirements:
 - a. ASTM C208, Table I ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - b. Flame spread both sides: Class A, Index 0-25.
 - 2. Vinyl wallcovering shall be multi-colored 20 oz. color selected by Architect. Fabric shall meet Federal Specification CCC-W-408A and have UL flame spread of 10, Class A. Full range of standard colors shall be available to choose from. Material shall be laminated to the base board by the manufacturer with wrapped corners.
- B. Tackboard Adhesive: Shall be quality grade drywall adhesive as recommended by the manufacturer with wrapped corners.
- C. Aluminum Trim: Top, bottom and sides shall have 1/2 inch "J" trim. Aluminum trim shall have a clear anodized finish, unless noted otherwise on Drawings.

- D. Size: As indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Coordination with other Work: Coordinate with other work that affects, connects with, or will be concealed by this Work.
- C. Verify that grounds and solid blocking necessary for proper installation of chalkboard panels has been installed.

3.2 INSTALLATION

- A. Marker boards and Wall Panels: Install at locations shown on Drawings in accordance with manufacturer's printed specifications, except as otherwise detailed.
 - 1. Install plumb, level and true to line, securely attached to grounds, blocking and supports.
- B. Tackable Wall Panels: Install tackable wall panels in locations as shown on Drawings, in accordance with manufacturer's recommendations and as herein specified. Where cutting a panel is required, the vinyl side shall be cut a minimum of one inch larger than the board side. Peel off the backing board and wrap the extra vinyl around the cut edge of the board and secure with adhesive before installation of panel. Where multiple panels are butted to one another the side trim pieces may be eliminated.

3.3 CLEANING

- A. Upon completion of installation, Contractor shall clean chalkboards, marker boards and wall panels and leave them in perfect ready-to-use condition.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 10 1150

PREMIUM DRY ERASE WALL COVERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Division includes
 - 1. Dry Erase Wall Covering
 - 2. Magnetic Self Stick Dry Erase Wall Coverings
 - 3. Self Stick Dry Erase Wall Covering
 - 4. Tackable Cork Dry Erase Wall Covering
 - 5. Tray, Trim, and Presentation Rails
 - 6. Accessories
- B. Related Divisions
 - 1. Section 09 2900: Gypsum Board: Wall substrate.
 - 2. Section 09 9100: Painting and Coating: Preparation and Priming of Substrate Surfaces.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM 84-91a Surface burning characteristics of building materials.
- B. Gypsum Association
 - 1. GA-14-M-97 recommended finish levels of gypsum board
- C. NFPA

1.3 SUBMITTALS

- A. Manufacturers' descriptive product data and installation instructions for all dry erase wall covering, adhesive, and accessory required.
- B. Manufactures recommended care and maintenance for all Jot-a-wall products.
- C. Samples:
 - 1. 7"x9" sample of each dry erase material specified.
 - 2. 6" sample of all trim, tray, and end caps specified.

1.4 QUALITY ASSURANCE

- A. Installer: Installation by skilled commercial wall covering contractor with no less than three (3) years of documented experience installing dry erase wall covering.
- B. SURFACE BURNING CHARACTERISTICS CLASSIFICATION: Provide materials that meet Class I/A rating when tested in accordance with ASTM E84 for flame spread and smoke developed.
- C. Field Samples: Prepare field samples for Architect's review and establish requirements for

seaming and finish trim.

1. Install sample panel of each type presentation wall covering specified in area designated by Architect.
2. Maintain corrected and approved samples to serve as standard of performance for the project.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver presentation wall coverings to the project site in unbroken and undamaged original factory packaging and clearly labeled with the manufacturer's identification label, quality or grade, and lot number.
- B. Store materials in a clean, dry storage area with temperature maintained above 50°F (10°C) with normal humidity. Store material within original packaging to prevent damage.

1.6 PRODUCT CONDITIONS

- A. Do not apply presentation wall coverings when surface and ambient temperatures are outside the temperature ranges required by the wall covering manufacturer.
- B. Provide continuous ventilation and heating facilities to maintain substrate surface and ambient temperatures above 55°F (13°C) unless required otherwise by manufacturer's instructions.
- C. Apply adhesive when substrate surface temperature and ambient temperature is above 55°F (13°C) and relative humidity is below forty percent.
- D. Maintain constant recommended temperature and humidity for at least 72 hours prior to and throughout the installation period, and for 72 hours after wall covering installation completion.

1.7 WARRANTY

- A. Five (5) year limited warranty. Jot-a-wall warrants that the surface will maintain its writing performance and not stain under normal conditions, when used in strict accordance with or care and maintenance instructions.

1.8 MAINTENANCE

- A. Before initial use of the writing surface, the material must be cleaned with Expo cleaner and a soft cloth. Then rinse with clean water and towel dry. We recommend the use of original Expo markers (sometimes called Expo Bold markers) for optimum performance. Other markers can also be used, but should be tested for acceptability before use across the entire writing surface.
- B. Long-term exposure of the Jot-a-wall dry erase surface to permanent markers may result in the marker penetrating the surface, leaving a permanent stain. Permanent marker may be removed by writing over the mark with a dry erase pen (using circular motions over the permanent marker) letting it dry and then erasing. Alternatively, the mark may be removed with isopropyl alcohol, but time is a critical factor in preventing migration of the marker into the material. The longer the permanent marker is left on the material, the more difficult it is to remove.

- C. Use only felt erasers. Remove dry-erase markings with a felt eraser for longer lasting surface effectiveness. Press firmly when erasing, using a circular motion. Change erasers as they become dirty. Dirty erasers leave excess ink on the surface of the board.
- D. Caution: Any sharp edged eraser can scratch the dry erase surface. Change erasers as they become soiled to avoid leaving excess marker residue on the surface of the board. For cleaning marker residue build-up, use Jot-a-wall's cleaner or Expo's dry erase cleaning solution and a soft towel. Then rinse with clean water and towel dry. For long term care we strongly suggest the entire writing surface be cleaned on a regular basis to insure the ultimate performance and appearance of the product. Warning: Never use abrasive cleaners or cleaning tools, hard edged erasers, sharp pointed writing instruments or sharp edged magnets on any Jot-a-wall products.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. JO-SS-50: Self-stick adhesive vinyl dry erase wall covering. Purpose is for re-surfacing chalkboards or ghosted dry erase marker boards.
 - 1. Total Weight: 24 oz. per lineal yard
 - 2. Backing: Adhesive
 - 3. Roll Width: 50"/ 127 cm
 - 4. Roll Length: 100'/ 30.48 m
 - 5. Total Thickness: 11 mil/ .279 mm
- B. JO-RM-SS: Vinyl dry erase wall covering with an adhesive backing. May be installed over finished "primed" drywall, old chalkboards, or ghosted dry eraseboards.
 - 1. Total Weight: 11.25 oz. per lineal yard
 - 2. Backing: Adhesive
 - 3. Roll Width: 50"/ 127 cm
 - 4. Roll Length: 100'/ 30.48 m
 - 5. Total Thickness: 8.3 mil/ .2108 mm
 - 6. Fire Rating: Class 1: NFPA
- C. JOM-SS-50: Vinyl dry erase wall covering with a magnetic surface and adhesive backing. Purpose is to convert a regular chalkboard or a ghosted dry erase board into a magnetic dry erase surface.
 - 1. Total Weight: 30 oz. per lineal yard
 - 2. Backing: Adhesive
 - 3. Roll Width: 49"/50"/ 124.46 cm/127 cm
 - 4. Roll Length: 50'/ 15.24 m
 - 5. Total Thickness: 14 mil/ .356 mm
- D. JOM-WC-50 and JOM-WC-60: Non-magnetic Vinyl dry erase wall covering with a non-woven backing. Applied with commercial wall covering adhesive directly to a properly prepared drywall surface.
 - 1. Total Weight: 35 oz. per lineal yard
 - 2. Backing: Non-woven
 - 3. Roll Width: 49"/50"/ 124.66 cm/127 cm
 - 4. Roll Length: 50'/ 15.24 m
 - 5. Total Thickness: 21 mil/ .533 mm
 - 6. Fire Rating: Class A

2.2 TRIM AND TRAY

- A. Aluminum Trim: 1-3/4" face and 5/16" depth

2.3 ACCESSORIES

- A. Adhesive: Heavy duty clear or clay based vinyl adhesive.
- B. Primer: White pigmented acrylic primer formulated for use with vinyl wallcovering.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Observe before hanging, wall conditions to ensure wall conditions meet or exceed Level 4 finish.
- B. Test walls to receive dry erase material with moisture meter. Moisture shall not exceed 4 percent.
- C. Wall Surfaces shall be smooth, clean, structurally sound and free from imperfections that could show through the surface of the material.
- D. Contact the General Contractor and Architect in writing of any conditions that could cause delay to installation.

3.2 INSTALLATION

- A. WALLCOVERING BACKED MATERIAL: JOM-WC-50, JOM-WC-60, JO-WC-50, JO-WC-60
 - 1. Acclimate wall covering 24 hours before installation in the area to receive wall covering.
 - 2. Follow manufacture's installation instruction.
 - 3. Examine material for color, quality, and quantity, as specified prior to cutting.
 - 4. Adhesive: Use heavy duty premixed clear or clay based vinyl adhesive.
 - 5. Primer: Use a white acrylic wall covering primer.
 - 6. Install all material in the exact order as it is cut from the bolt. Reverse hang alternate sheets.
 - 7. Do not crease or bend material during installation.
 - 8. Install horizontally using a level, or straight line.
 - 9. When installing floor to ceiling, seam the material out of the optimum writing area.
 - 10. Smooth the surface of the material with a wall covering smoother, wrapped with a soft cloth. Take out all air bubbles, wrinkles, gaps, and overlaps. Do not use sharp edged smoothing tools. Smooth wall covering from the middle of the sheet to outside edges.
 - 11. Remove any adhesive from the surface of the material using warm soap solution and rinse with clean water.
 - 12. Make sure there isn't any residue of adhesive or soap left on the writing surface.
 - 13. Stop installation of material that is questionable in appearance and call distributor of product.

3.3 CLEAN UP

- A. After installation remove all excess adhesive immediately using a soft cloth and warm soapy

solution.

- B. Whether the product is installed with adhesive or is a self-stick product rinse the material with clean water after installation and dry with clean soft towel.
- C. After installation, remove rubbish and debris caused from the dry erase installation. Leave the area neat and clean.

END OF SECTION

SECTION 10 1200

DISPLAY CASES

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Display cases.
- B. Related Sections:
 - 1. Division 26 - Electrical; rough-in for light fixture.

1.2 SUBMITTALS

- A. Product Data: Submit in accordance with SECTION 01 3300 -SUBMITTAL PROCEDURES. Include installation instructions.
- B. Samples: Submit in accordance with SECTION 01 3300 – SUBMITTAL PROCEDURES. Submit a 12" square sample of tackboard material and a 12" length of trim.

1.3 COORDINATION

- A. Coordinate the Work of this Section with the work of Division 26 Electrical sections required for installation and hookup of lighting fixtures furnished with display cabinets.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide 390 Series display cases as manufactured by Claridge, Inc.; sizes as shown by Drawings. Provide manufacturer's optional LED strip fixture. Equivalent products of one of the following will be acceptable:
 - 1. A-1 Visual Systems
 - 2. Nelson-Harkins Industries
 - 3. Poblocki Sign Company

2.2 MATERIALS

- A. Aluminum Extrusions: Provide manufacturer's standard extruded aluminum sections of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5 alloy.
- B. Glass: Provide clear, tempered safety glass complying with the requirements of ASTM C 1048, Type I, Kind FT, Condition A, Class 1 - transparent.
- C. Tackboard: Provide seamless sheet, 1/4" thick ground natural cork compressed with a resinous binder with washable vinyl finish and integral color throughout, laminated to burlap backing. Provide color and texture as selected by Architect.
- D. Fasteners: Provide screws, bolts, and other exposed fastening devices of the same material as the items being fastened. Use theft-proof fasteners.

- E. Glazed Sliding Doors: 3/16" thick tempered glass, framed, with extruded aluminum frame; supported on ball-bearing rollers.
 - 1. Lock: Furnish each cover with the manufacturer's standard lock; key all locks alike. Furnish 2 keys per lock.
- F. Exposed Interior Surfaces: Plastic laminate as specified by Section 09 99 00 Color Schedule.
- G. Light Fixture: Double row LED strip fixture with diffuser furnished by display case manufacturer, ready for hookup to electrical rough-in.

2.3 FABRICATION

- A. General: Fabricate display cases to comply with dimensions, design, and details, and quality indicated.
- B. Fabricate perimeter and cover frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- C. Hardware for Covers: Equip covers with the manufacturer's standard hardware of the type indicated.
- D. Provide the manufacturer's standard recessed display cases, fabricated to sizes indicated, consisting of the display case housing with perimeter frame, sides and back, tackable surface, and operable transparent covers with hardware.
- E. Perimeter Frame and Cover Design: Provide extruded aluminum perimeter frame of profile indicated. Provide extruded aluminum door frame of the profile indicated, glazed with 3/16" thick clear tempered glass.
- F. Finish: Class II, Clear Anodic Finish, AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating) complying with AAMA 611.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install units plumb, and level, in locations shown. Securely attach to the supporting structure with concealed fasteners, in accordance with the manufacturer's installation instructions. Connect light fixtures furnished with display cabinets to electrical rough-in provided as part of Division 26 Electrical work.

3.2 CLEANING AND PROTECTION

- A. Upon completion of installation, clean surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Architect.

END OF SECTION

SECTION 10 1400
INTERIOR SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Door signs identifying designed rooms or spaces.
 - 2. ADA signs.
 - 3. Tactile exit signs.
 - 4. Occupant load signs.

1.2 REFERENCES

- A. Americans With Disabilities Act (ADA):
 - 1. ADA - Americans with Disabilities Act; Federal Register, Volume 56, No. 144 28 CFR part 36.
- B. Texas Accessibility Standards (TAS):
 - 1. TAS - Texas Accessibility Standards of the Architectural Barriers Act, Article 9101, Texas Civil Statutes.

1.3 SUBMITTALS

- A. Section 01 3300 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Provide data on signage materials, standard sign types and dimensions.
- C. Shop Drawings: Indicate each sign location referenced from door number, styles, lettering font, sign message text, foreground and background colors, locations, overall dimensions of each sign.
- D. Samples for Selection: Submit manufacturer's complete set of signage color samples for Architect initial color selection.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Handicapped accessible accessories shall comply with ADA and TAS.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Section 01 6000 - Product Options: Transport, handle, store and protect products.
- B. Deliver to site in original unopened packaging materials necessary to protect finishes clearly labeled with manufacturer name and product model and description.
- C. Package signage items; label and identify with door opening code to match approved signage schedule.
- D. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- E. Project Field Superintendent shall inspect Products immediately upon delivery to Project

Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.

- F. Store in packaging until installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for Interior Signage is based on the product named.
 - 1. Mohawk Sign Systems, Incorporated: www.mohawksign.com.
- B. Section 01 6000 - Product Options: Product options and substitutions. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
 - 1. ASI Sign Systems: www.asisign.com.
 - 2. Bayuk Graphic Systems, Inc: www.bayukgraphics.com.
 - 3. Best Manufacturing Company: www.bestsigns.com.

2.2 GRAPHIC PROCESS

- A. All signs shall be manufactured using Graphic Process Series 200A Sand Carved Process using Format D.
 - 1. Tactile characters shall be raised the required 1/32 inches from sign face.
 - a. Glue-on letters or etched backgrounds are not acceptable.
 - 2. Text shall be accompanied by Grade 2 Braille. Braille shall be separated 1/2 inch from the corresponding raised characters or symbols. Grade 2 Braille translation provided by signage manufacturer.
 - 3. Letters, numbers and symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.
- B. Plaque material shall be melamine plastic pressure laminate approximately 1/8 inch thick with contracting core color which provides resistance to abrasion, stains, alcohol, solvents, boiling water, and heat.
 - 1. Material shall be NEMA rated and have flammability and smoke values that meet the standards for flammability of interior materials.
- C. Background: Color as selected by Architect from manufacturer's actual color samples.
- D. Letterform: Helvetica upper case letters and numbers. Room numbers and names will be verified with Owner and will be identified by Architect during submittal review.
- E. Size:
 - 1. Room Numbers: 1 inch.
 - 2. Lettering for Room ID Signs: 1 inch.
 - 3. Handicapped Symbol Size: 4 inches.
 - 4. Braille: Standard Grade 2, 1/2 inch below copy.
 - 5. Corners: 1/2 inch radius.
- F. Copy position: CC (centered/centered).

2.3 SIGN TYPES

- A. Type A - Office: Design M-310-A with one window or M-310-B with two windows where

required with Grade 2 Braille.

1. Plaque Size: 6 inches x 6 inches.
 2. Graphic Design:
 - a. Room Number
 - b. Room Name
 - c. Grade 2 Braille
 - d. Window Insert (Insert by Owner)
- B. Type D - Restroom Room Sign: Design M-1000; ADA-4 with 4 inch accessibility and gender specific symbol with verbal description placed directly below followed by Grade 2 Braille.
1. Plaque Size: 8 inches x 8 inches.
 2. Graphic Design:
 - a. Gender Specific Symbol
 - b. Accessibility Symbol
 - c. "WOMEN" or "MEN"
 - d. Grade 2 Braille
- C. Type E - Tactile Exit Sign (Required by IBC Section 1011.3): Design M-1000-M311 Exit Sign stating "EXIT," tactile characters complying with ANSI A117.1, with Grade 2 Braille.
1. Plaque Size: 6 inches x 6 inches.
 2. Graphic Design:
 - a. "EXIT"
 - b. Grade 2 Braille

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
- B. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions ADA and TAS.
- B. Install signs after doors are finished, in locations indicated.
- C. Provide high pressure laminate backing plate on back side of glass when signs are installed on glass sidelight.

3.3 FIELD QUALITY CONTROL

- A. Section 01 4500 - Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 1. Inspect interior sign types, locations, mounting heights, numbers and text, finish and color.
 2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 3. Test and Inspection Reports shall be available to Architect upon request.

- B. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

END OF SECTION

SECTION 10 1450

SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Furnish and install Signage Work as specified herein and from Allowance.

1.2 SUBMITTALS

- A. Supplier shall meet with owner and architect to discuss requirements of signage package prior to submission of shop drawings.
- B. General: Submittals requirements are specified in Section 01 3300, Submittal Procedures.
- C. Product Data: Submit manufacturer's brochures.
- D. Furnish schedule listing material, size, and text for each unit
- E. Shop Drawings: Show sizes of members, method of construction, copy layout, and mounting details for proper mounting.
- F. Samples: Submit samples of material for color selection from manufacturer's full color line, as applicable.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by taking field measurements. Proper fit and attachment of parts is required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, subject to compliance with specifications herein.
 - 1. All Sign Systems, Inc.
 - 2. Apco
 - 3. Mountain State Specialties
 - 4. Matthews
 - 5. Metallic Arts
 - 6. Vomar Products Inc.
 - 7. Seton Corp.

2.2 MATERIALS

- A. EXTERIOR:
 - 1. Cast Metal Letters:
 - a. Font Style shall be Caps and Bold.
 - b. Letters shall be equal to Matthews International Corporation cast bronze, or aluminum or prior approved equal.

- c. One 12"h letter shall be provided at a minimum of two locations and a maximum of 3 locations for each proposed building or as shown on drawings for Fire Department recognition
 - d. Finish shall be Anodized aluminum on face and edges.
 - e. Letters shall be standoff 1 inch mounted with aluminum spacer.
 - f. Letters shall have been pre-drilled and pre-tapped to receive threaded studs.
 - g. Provide where indicated on drawings or is directed by architect.
 - (1)
 - 2. Dedication plaque:
 - a. Font Style shall be Caps, and Book or as noted on drawings.
 - b. 18" X 24" size.
 - c. Material shall be cast aluminum.
 - d. Design and finish shall be selected by architect from manufacturers full line of products.
 - e. Copy to be subsurface with sample to be approved by Architect.
Provide where indicated on drawings or where directed by Architect.
- B. INTERIOR
- 1. Regulatory Signage:
 - a. Fire Riser room signs per requirements of governing jurisdiction.
 - b. Fire Department Connection sign permanently chain hung per requirements of governing jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine subsurface and supports to receive Work and report in writing, with a copy to Architect, detrimental conditions. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for correction(s) Architect may require. Commencement of Work will be construed as acceptance of subsurface.
- B. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.
- C. Coordination with other Work: Coordinate with other work that affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. General: Install items plumb and level and in accordance with manufacturer's printed installation instructions and additional requirements as specified.
- B. Mounting: Wall mounted items shall be securely fastened to solid backing, blocking, or supports.
- C. Install all identifying devices after all surfaces and adjacent surfaces are finished.
- D. Mount in accordance with adopted accessibility guidelines and code requirements.
- E. Wall mounted signage
 - 1. Silicone-adhesive mounting: use liquid silicone adhesive recommended by sign manufacturer to attach sign units. Use double sided vinyl tape on back of sign, where recommended by manufacturer to hold the sign in place.

2. Double-Stick Tape Mounting: Clean surfaces to be joined and apply tape to back of sign in continuous strips at 2 inches on center, spacing as needed.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 10 2115

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Plastic Toilet Compartments as shown on Drawings and as specified herein.

1.2 WARRANTY

- A. Special Warranty: The following warranty shall be submitted to the Owner in addition to the Warranty described in Section 01 7700, Closeout Procedures.
 - 1. Manufacturer shall warrant plastic toilet partitions to be free from manufacturing defects in workmanship or material for a period of ten (10) years from date of installation, including breakage, delamination or rust.

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit Shop Drawings for Work herein showing plans, elevations, details of construction, sizes of openings and parts, anchoring details, leveling details, finish color, hardware fittings and fastenings.
- C. Samples: Submit two (2) samples of manufacturer's standard colors and hardware for selection and approval by Architect.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Plastic Toilet Compartments shall be products of one of the following manufacturers subject to compliance with specification requirements.
 - 1. Bradley Corp.
 - 2. General partitions
 - 3. PSISC/Columbia Partitions
 - 4. Scranton Products

2.2 MATERIALS

- A. Panel, doors and pilasters shall be fabricated from high density polyethylene (HDPE) containing a minimum of 10% recycled resin, manufactured under high pressure forming a single component section in colors that extend from the surface throughout the core, and shall meet all applicable code requirements. Colors of all components to be selected from manufacturer's standard for the series specified.
 - 1. Style: floor mounted, overhead braced with non-corrosive panels, doors and pilasters.
 - 2. Doors, panels and pilasters: 1-inch thick with edges machined to a radius of .250 inch.
 - 3. Doors shall be 55 inches high, 24 inches wide (34 inches wide for accessible compartments to provide a minimum clear opening of 32 inches) and mounted at

- 14 inches above finished floor. Stainless steel or aluminum edging strips shall be fastened to the bottom edge of doors full width.
4. Dividing panels shall be 55 inches high and mounted at 14 inches above finished floor, with the exception of panels at the end of layouts which shall extend up to and be fastened into headrail. Stainless steel or aluminum edging strips shall be fastened to the bottom edge of panels full length using non-tamper screws.
 5. Pilasters shall be 82 inches high with solid plastic pilaster shoe attached with non-tamper screws.
 6. Urinal screens at Athletic Offices shall be pilaster braced, of material and construction similar to that used in the toilet partitions. Size shall be 42 inches high, 18 inches deep, mounted 18 inches above the floor.
 7. Urinal screens at Concessions Buildings shall be floor mounted of material and construction similar to that used in the toilet partitions. Size shall be 42 inches high, 18 inches deep.
 8. Full length continuous wall and pilaster brackets for partitions shall be solid plastic weighing not less than 0.822 pounds per lineal foot to be used for panels to pilaster, pilaster to wall and panel to wall connections. Wall brackets shall be predrilled by manufacturer with holes spaced every 12 inches along full length of brackets.
 - a. Wall brackets shall be thru-bolted to panels and pilasters with one-way sex bolts. Attachment of brackets to adjacent wall construction shall be accomplished by (1) toggle bolt directly behind the vertical edge of panels and pilasters at every 12 inches along the full length of bracket and (2) No. 5 plastic anchors and No. 14 x 1-1/4 inch cadmium plated philips head screws at each 12 inch interval alternately spaced between toggle bolt connections.
- B. Hardware:
1. Hinges: continuous, spring-loaded type. Hinges shall be factory set to stand open to the degree required.
 2. Coat hook/bumper: chrome plated with rubber bumper. At outswinging doors install additional bumper on the outside of the door.
 3. Door strike and keeper: heavy aluminum extrusion (6061-T5 Alloy) with clear anodized finish, surface mounted and thru-bolted to door with one-way sex bolts. At accessible compartments provide ADA compliant hardware.
 4. Headrail: aluminum extrusion (636-T5 Alloy) with clear anodized finish in anti-grip configuration weighing not less than 1.188 lb. per linear foot. Headrail shall be fastened by thru-bolting with one-way stainless steel sex bolts. Headrail bracket shall be 20 gauge stainless steel.
- C. Toilet Partitions at Concession Buildings
1. GC to field verify existing toilet partitions and match existing.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions..
- B. Coordination with other Work: Coordinate with other work that affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Install toilet compartments in strict accordance with manufacturer's printed instructions.

- B. Erect in a rigid substantial manner, straight and plumb, with horizontal lines level. Clearance at the wall shall be approximately 1 inch for panels and 1 inch for pilaster. Clearance at vertical edges of doors shall be uniform from top to bottom and shall not exceed 3/16 inch.
- C. Evidence of drilling, cutting and fitting to room finish shall be concealed in the finish Work.
- D. Adjust hardware and leave in perfect working order. Adjust door hinges to hold door open at approximately 30 degrees

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 10 2813
TOILET ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Toilet Accessories as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. ANSI A117.1 - Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit brochures and product data of toilet accessory items showing sizes, methods of construction and mounting techniques.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or specifically prior approved by the Architect, Toilet Accessories shall be products of one of the following manufacturers, subject, however, to compliance with specifications requirements.
 - 1. Gamco
 - 2. A.S.I.
 - 3. Bobrick Washroom Equipment Co., Inc.
 - 4. Bradley Corporation
 - 5. Kirsch (shower curtain track)
 - 6. Koala Corporation (baby change stations)

2.2 MATERIALS

- A. Stainless Steel: AISI, Type 302/304, with satin No. 4 finish. Unless specified or indicated, the use of other stainless steel alloys.
- B. Sheet Steel: Cold rolled, commercial quality, ASTM A366. Surface preparation and metal pretreatment as required for applied finish.
- C. Chromium Plating: Nickel and chromium electro-deposited on metal, ASTM B456, Type SC 2.
- D. Galvanized Steel Mounting Devices: ASTM A123, hot-dip galvanized after fabrication.
- E. Locks shall be tumbler type, keyed alike for toilet accessories on this project, unless specified otherwise.
- F. Fasteners: Theft-proof screws. No adhesive mountings shall be used.

- G. Backing Plates: 16 gauge cold-rolled steel for mounting grab bars and/or all other wall mounted accessories in stud partitions. Backing shall be 12" wide and span three studs minimum with 2 screws each stud. Where allowed by code fire-treated wood backing may be used.

2.3 TOILET ACCESSORIES

- A. Separate Side and Rear Grab Bars: Equal to Bobrick B-5806 Series, stainless steel, 1-1/4 inch diameter, concealed mounting, peened non-slip finish, at locations as shown on Drawings. Grab bars shall be able to support at least 900 pounds.
- B. Paper Towel Dispensers: Owner Furnished, Contractor Installed.
- C. Mirrors: Equal to Bobrick B290/1830 stainless steel frame; provide mirror at all toilet rooms above lavatory and as indicated on the Drawings.
- D. Multi-roll Toilet Tissue Dispenser: Owner Furnished, Contractor Installed.
- E. Feminine Napkin Disposal Unit: Equal to Bobrick B354 stainless steel, partition mounted for two adjacent toilet compartments. Bobrick B3544 stainless steel, recessed wall mounted for sidewall of end toilet compartments.
- F. Feminine Napkin Dispenser Unit: Equal to Bobrick B282-25.
- G. Soap Dispenser: Owner Furnished, Contractor Installed.
- H. Shower Curtain Track: Kirsch No. 9600, ceiling type for surface installations. Track to be extruded anodized aluminum. See Drawings for location and configuration.
- I. Shower Curtain Rod: Shall be Bobrick 207 Series. Provide and install at each shower location.
- J. Shower Seat: Equal to Bobrick B-5181 folding seat. Install one per shower locations or as indicated on the drawings.
- K. Mop Rack: Bobrick B223 x 36 stainless steel, satin finish with anti-slip mop holders B224 x 36 stainless steel, satin finish with anti-slip mop holders, shelf and rag hooks.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Coordinate with other work that affects, connects with, or will be concealed by this Work.
- C. Where accessories are to be located in a fire rated assembly provide such locations to the affected trades prior to installation so that provisions for maintaining the fire rated integrity of the assembly can be made.

3.2 INSTALLATION

- A. Install all items in accordance with manufacturer's published instructions and approved installation drawings in locations as shown on Drawings, and in compliance with ANSI A117.1 as applicable.
- B. Secure toilet room accessories to adjacent walls and partitions in accordance with the manufacturer's instructions for each item and each type of substrate construction and as follows:
 - 1. Attachment to Toilet Partitions: Secure at screw attachment point with sheet metal screws furnished by manufacturer or by 3/16 inch diameter through-bolts.
 - 2. Attachments of Recessed Accessories: Shims shall be placed between framing and cabinet at screw attachment points.
 - 3. Attachment of Surface Mounted Accessories: At stud walls, concealed blocking or backing shall be provided at screw points to allow attachment. At solid walls, wall plugs, expansion shields or toggle bolts shall be provided.
- C. Grab Bars:
 - 1. Framed wall construction: Attachment must be sufficient to withstand a horizontal pull of 300 pounds. Accurately position connector assemblies and tighten to the support angles before wall finish is applied. After wall surface is finished, secure concealed mounting plate to connector assembly using stainless steel machine screws furnished by the manufacturer.
 - 2. Toilet Compartments: Through-bolted connection with specified anchors.
- D. Seal wall penetrations with sealant as specified to prevent moisture penetration through joints around fixtures.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 10 4416
FIRE EXTINGUISHERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the manufacture and installation of Fire Extinguishers and Cabinets as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. NFPA 10 - Portable Fire Extinguishers
- B. IFC (International Fire Code) – Section 906

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit manufacturer's product data for each item specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers shall be products of one of the following manufacturers subject to compliance with these specifications' requirements.
 - 1. Amerex
 - 2. Ansul
 - 3. Badger Fire Protection
 - 4. General Fire Equipment Co., Inc.
 - 5. J.L. Industries
 - 6. Kidde
 - 7. Larsen's Manufacturing Co. (Basis of Design)
 - 8. Sentry

2.2 EQUIPMENT

- A. Fire Extinguishers:
 - 1. Fire Extinguisher: Multi-purpose dry chemical extinguishers with a UL rating of 2A-10B:C. All metal construction, including head and nozzle.
- B. Semi-Recessed Cabinets: Fire extinguisher cabinets shall be equal to Larsen's Model No. 2409-R3 semi-recessed cabinets with rolled edge. Provide additional trim extension where required. "Vertical Duo" front type with clear acrylic panel and non-removable vertical white lettering to read "Fire Extinguisher." Mount per TDLR requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Coordinate with other work that affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Comply with regulatory requirements and anchor securely where indicated. Mount cabinets at 27 inches above floor to bottom.
- B. Verify that extinguishers are charged and tagged. Contractor shall be responsible for initial filling and servicing.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 10 5113

METAL LOCKERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Metal Lockers as shown on Drawings and as specified herein.

1.2 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Submit drawings showing layout and installation details. Include numbering scheme/schedule.
- C. Submit samples or actual paint color chart for color selection.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Except as otherwise specified herein or approved by the Architect, metal lockers shall be products of one of the following manufacturers subject to compliance with these specification requirements:
 - 1. Art Metal Products
 - 2. ASI
 - 3. De Bourgh
 - 4. Lyons
 - 5. Penco Products
 - 6. Republic

2.2 FABRICATION

- A. General
 - 1. Steel: Prime grade mild cold rolled sheet steel free from surface imperfection.
 - 2. Fabricate lockers square, rigid and without warp. Metal faces shall be flat and free of distortion. All welds shall be free of burrs.
 - 3. Fillers: 20 gauge sheet steel. Attachment shall be by means of concealed fasteners. Fillers shall match finish of lockers.
 - 4. End Panels: 16 gauge sheet steel to match locker depth and height and shall have a 1" edge dimension. Attachment shall be by means of concealed fasteners. Panels shall match finish of lockers.
 - 5. Recessed Trim: 18 gauge sheet steel and have a 3" face dimension attached with concealed clips. Finish caps and splices shall be provided as required. Trim shall be finished to match lockers.
 - 6. Finish: Electrostatically applied powder coat enamel. Lockers shall be painted inside and outside with the same color.
- B. Type "A" Heavy Duty Locker
 - 1. Lockers shall be pre-assembled of welded construction. Grouping shall be the most practical that conforms to the job requirements. Each locker group shall be

securely welded into a one piece structure. No bolts, nuts or rivets shall be allowed in the assembly of main locker groups.

- a. Side and Door Frames: 16-gauge. The front edge of the frame shall be formed to a channel shape with a continuous door strike. Two and three tier lockers shall have intermediate 16-gauge channel shaped horizontal frame members welded to side frames. Intermediate frames shall consist of two 16-gauge frame channels securely welded together. Rubber silencers to be installed on all door frames.
- b. Backs: 18-gauge cold rolled steel.
- c. Tops: 16-gauge notched and formed. Each group of lockers shall have one continuous flat top.
- d. Bottoms: 16-gauge notched and formed. Each group of lockers shall have one continuous bottom suitable for anchoring to wood or concrete bases.
- e. Shelves: Top Shelf; 16-gauge, flanged on four sides with an additional return flange on the front edge to increase strength.
- f. Doors: One piece, 14 gauge steel with rubber silencers. Formations shall be channel shape on the hinge and latch side, and right angle formations across the top and bottom.
- g. Hinges: 16-gauge continuous hinges (full length of the door) are welded to the door and riveted to the frame.
- h. Latching: Handles shall be 226A stainless steel pockets with formed door pull recessed in the door.
- i. Number Plates: Each locker door to be supplied with a polished aluminum number plate. Owner shall provide numbers and sequence.
- j. Interior Equipment: single tier lockers 60" or higher shall have one hat shelf located approximately 9" down from the top of the locker. Lockers 20" or more in height and 12" or 15" wide shall have one double prong ceiling hook and two single prong wall hooks. Lockers over 15" wide shall have a double prong ceiling hook and four single prong wall hooks. All coat hooks shall be forged steel with ball ends, zinc plated.
- k. Ventilation:
 - (1) Perforations: Sides and doors shall be perforated with diamond-shaped openings.
 - (2) Louvers: Formed in face of door.
- l. Flat top
- m. Number Plates: Each locker door to be supplied with a polished aluminum number plate. Owner shall provide numbers and sequence.
- n. Base: 4 high, 16-gauge continuous metal base integral with locker bottom and shall fully enclose base of lockers at front and sides.
- o. Size: 12"w x 12"d x 72"high.

C. Accessible Lockers

- 1. Single tier lockers shall be 60" high, with recessed handle and 3 point latch with shelf no higher than 48" from floor.
- 2. Double tier lockers shall be 36" with recessed handle and 2 point latch, with lower tier to be assigned to the disabled.
- 3. Accessible signage shall be placed on locker door.
- 4. Locker bottom shall be 9" off the floor, or a shelf shall be installed at a minimum of 9" off the floor.

PART 3 EXECUTION

3.1 PROJECT SITE CONDITIONS

- A. Verify dimensions shown on Drawings by taking field measurements.

3.2 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Coordinate with work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.3 INSTALLATION

- A. Install lockers where indicated in accordance with manufacturer's recommendations and approved shop drawings.
- B. Units shall be neatly and securely assembled and joined together.
- C. Finish work shall fit well to surrounding construction. Install fillers at front and side surfaces to close space between lockers and wall surfaces.

3.4 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

PROTECTIVE COVERS

SECTION 10 7300

PART 1 – GENERAL

1.1 SUMMARY

- A. Provision, fabrication and installation of Extruded Aluminum Walkway Covers & Canopies, as shown on drawings and specified herein, and as needed for a complete and proper installation.

1.2 RELATED WORK

- A. Section 07 6200 Sheet Metal Flashing and Trim
- B. Section 07 9200 Joint Sealants
- C. Section 03 3100 Structural Concrete

1.3 REFERENCE STANDARDS (Specifications for)

- A. The Aluminum Association – Aluminum Design Manual 2010
- B. American Welding Society- AWS D1.2/D1.2M: 2008
- C. ASTM B 209 Aluminum & Aluminum Alloy Sheet and Plate
- D. ASTM B 221 Aluminum & Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

1.4 SAMPLES

- A. Submit samples in accordance with Section 01 3300 Submittal Procedures.
- B. Product data: manufacturer's brochures, manuals and literature.
- C. Shop Drawings:
 - 1. Includes the complete layout, sections, details, components, finishes, sizing, spacing, and fasteners specific to the project. The site-specific shop drawings shall show reactions at surface attachment points and bear the seal of a Registered Structural Engineer.
 - 2. General Contractor shall submit shop drawings for approval by the Architect prior to fabrication of any materials.
 - 3. General Contractor to verify all dimensions and elevations prior to submittal to Architect.
 - 4. Manufacturer shall field verify dimensions prior to fabrication.
- D. Finishes: samples of canopy finishes.

1.5 QUALITY ASSURANCE

- A. Canopy shall be designed to comply with state and local building codes.
- B. Canopy manufacturer shall have a minimum of 10 years' experience in designing and installing the specified system.

- C. The installation of the canopy shall be performed by the manufacturer to assure single source responsibility.

1.6 MATERIALS

- A. Delivery, Storage, and Handling: protect components from one another during shipping, storage and handling. Exercise care when unloading, storing, and erecting to prevent damage.

1.7 WARRANTY

- A. Provide manufacturer's 1-year warranty against defects in material and workmanship.

PART 2 – PRODUCTS

2.1 MANUFACTURER QUALIFICATIONS

- A. Basis of Design for Extruded Aluminum Walkway Covers & Canopies: Subject to strict compliance with the specified requirements and the plans, the following manufacturer is acceptable:

AVAddek Walkway Cover Systems & Canopies

12130 Galveston Road,
Building 1 Webster,
Texas 77598-1539
(713) 944-0988 or
(800) 777-4031

2.2 MATERIALS

- A. Components: all components shall be 6063, 6061, or 6005 alloy extruded aluminum.
- B. Design Criteria: all components shall be sized to comply with live load and wind load requirements of the project and shall not be less than the dimensions shown on the plan.

2.3 COMPONENTS

- A. Configuration: as shown on the drawings
- B. Sizes: minimum sizing as shown on the drawings
- C. Columns: all columns shall have radius corners
- D. Beams: beams are open at top to drain canopy system internally into columns
- E. Deck: deck thickness shall be at least .080" thick
- F. Flashing: flashing thickness shall be at least .040" thick

2.4 FASTENERS, CONNECTIONS, AND FITTINGS

- A. Bolted Connections: All bolts, nuts, washers, and screws used in joining the members shall be stainless steel up to 3/8" diameter. Over 3/8" diameter may be Hot Dipped Galvanized.
- B. General Contractor shall provide structural attachment points flush with the outside surface of the building.

- C. Rafters shall be heliarc welded to wall mounting plates which are bolted to walls.
- D. Beams are fastened to Rafters with Concealed Clips.
- E. Blades are mechanically fastened to structure with Stainless Steel Screws, concealed where able.

2.5 FINISH

- A. Satin etched Clear Anodized – Aluminum Association Specification AA-M10-C22-A31.
- B. AAMA 603.8 Baked Polyester Enamel Painted at Roof Panel / Color: To be selected by Architect.
- C. AAMA 607.5 Kynar 500 Fluoropolymer Based Painted 2 Coat / Color: To be selected by Architect from full range of colors.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. The components and accessories are to be supplied and installed by the manufacturer.
- B. Install canopy in strict accordance to manufacturer's recommendations.
- C. Erect canopy after concrete and masonry work in the vicinity is completed and washed down.

3.2 WORKMANSHIP

- A. Take extreme care to prevent damage or scratching. Replace damaged components prior to installation. All workmanship must be top quality with meat miters and fitted joints.

3.3 CLEANING

- A. Just prior to completion of project, strip protective coatings of covering from aluminum and clean all parts. Repair to new condition to replace any materials damaged during installation.

END OF SECTION

SECTION 11 3100

APPLIANCES

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Appliances.
- B. Related Sections:
 - 1. Section 06 4000 - Architectural Woodwork: millwork.
 - 2. Division 22 - Plumbing: plumbing rough-in.
 - 3. Division 26 - Electrical: electrical rough-in.

1.2 SUBMITTALS

- A. General: Submit in accordance with SECTION 01 3300 – SUBMITTAL PROCEDURES.
- B. Product Data: Include list of optional features, operating characteristics, and dimensions of individual appliances.
- C. Operating and Maintenance Manuals: Provide per SECTION 01 7700 – CLOSEOUT PROCEDURES.
- D. Shop Drawings: Submit rough-in drawings showing dimensioned locations of electrical and plumbing stub-outs for appliances.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Provide electrical components required as part of appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
- B. Accessibility Standards: Where appliances are required to comply with accessibility requirements, comply with Texas Accessibility Standards (TAS) and ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities (International Building Code).

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Appliances shall be of the quality manufactured by Whirlpool Corp. and U-Line Corp. and are listed by Whirlpool and U-Line catalog numbers for convenience in identification. The use of a catalog number as a description of an item shall be taken to include the description or specification for the item in the manufacturer's catalog. Equivalent items of the following manufacturers are acceptable:
 - 1. Bosch
 - 2. GE Appliances

2.2 EQUIPMENT

- A. Dishwasher: 800 Series Bar Handle Special Application Dishwasher, white, Model No. SHXM88Z75N as manufactured by Robert Bosch GmbH. Stainless steel tub, Energy Star, delay wash, and not more than 57db. Height adjustable from 32-1/16" (ADA height) to 34-7/16" (Standard height). Dishwasher shall be certified to NSF/ANSI 184 requirements for

residential dishwashers for 99.999% or 5-log reduction of bacteria when operated on the sanitizing cycle, and for reaching a final rinse temperature of 150° F.

1. Electrical characteristics: 120 V, 60 Hz, 1 ph.; 1440 W (12.0 A).
- B. Ice Maker: Crescent Series Model No. BI98 as manufactured by Uline; produces 25 lbs. ice per day, 25 lbs. ice storage capacity, forms crescent ice cubes; include ULAWATERHOOKUP braided water supply line kit. Color: Stainless Steel.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions.
- B. Built-in Appliances: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Appliances: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate appliances.

3.3 CLEANING AND PROTECTION

- A. Test each item of appliances to verify proper operation. Make necessary adjustments. Verify that accessories required have been furnished and installed.
- B. Remove packing material from appliances and leave units in clean condition, ready for operation.
- C. Protection: Protect the completed work from damage.

END OF SECTION

SECTION 12 2113

HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes fabrication and installation of Horizontal Louver Blinds as shown on the Drawings and as specified herein.

1.2 SUBMITTALS

- A. Submittal requirement are specified in Section 01 3300, Submittal Procedures.
- B. Samples: Submit two samples of blind materials, colors and patterns.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Except as otherwise specified herein, or equal as specifically prior approved by the Architect, blinds shall be products of one of the following manufacturers, subject to compliance with specifications requirements.
 - 1. Levelor Corporation
 - 2. Hunter Douglas Inc.
 - 3. Springs Window Fashions Division, Inc. (Bali, Graber)

2.2 HORIZONTAL MINI-BLINDS

- A. Levelor Riviera, or as approved.
 - 1. Headrail: Shall be of .025 inch thick, "U" shaped, 1 inch high x 1-9/16 inches wide. Hardware shall be enclosed in the metal headrail.
 - 2. Tilter: Mechanism shall be of a .042 inch thick Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to eliminate overdrive.
 - 3. Tilt Wands: Shall be transparent with a hexagonal cross section 5/16 inch across flats.
 - 4. Cord Lock: Shall be of .042 inch thick Tomized steel and shall be crash proof.
 - 5. Drum and Cradle: Shall be provided for each ladder.
 - a. Drums shall be of .031 inch thick Tomized steel.
 - b. Cradles shall be of .042 inch thick Tomized steel.
 - 6. Brackets shall be of at least .048 inch thick Tomized steel with a rivet-hinged safety locking front cover to permit removal of headrail without lateral movement.
 - 7. Ladders (slat supports): Distance between slats shall not exceed 11 slats per vertical foot.
 - 8. Slats: Shall be of 5000 series magnesium aluminum alloy only, not to include reprocessed metals. Slats shall be nominally 1.375 inches +/- .003 inch wide and .0075 inch +/- .0003 inch thick (prior to coating); after coating, the thickness of the slats shall be nominally .0090 inch. Slats shall be unperforated.
 - 9. Bottom rail shall be of .025 inch thick Tomized steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Coordinate with work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Ensure all necessary backing/blocking has been installed.

3.2 INSTALLATION

- A. Install window blinds in strict accordance with manufacturer's instructions. Install straight and plumb, securely fastened, and with horizontal lines level and true with window framing. Evidence of drilling, cutting and fitting to room finish shall be concealed in the finish work. Clearance at edges shall be uniform and not exceed 3/16 inch. Adjust hardware for smooth operation.
- B. Install blinds between vertical window mullions with discontinuous head channel and slats, allowing independent blind operation for separate glazing units.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 12 2400

WINDOW SHADES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the design, fabrication and installation of manually operated roller shades including all necessary supports, brackets and accessories for a complete installation.

1.2 REFERENCES

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- B. NFPA 70 - National Electrical Code
- C. NFPA 701- Standard Method of Fire Tests for Flame Propagation of Textiles and Films

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years' experience in manufacturing products comparable to those specified in this section.
- B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years' experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
- E. Anti-Microbial Characteristics: "No Growth" per ASTM G21 results for fungi ATCC9642, ATCC9644, ATCC9645.
- F. Mock-up: Provide a mock-up of one roller shade assembly for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up in window designated by Architect.
 - 2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.4 WARRANTY

- A. Hardware, chain and shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.

1.5 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Provide manufacturer's information for each product to be used.

- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances and relationship to adjacent work. Use same room designations as indicated on the Drawings and include opening sizes.
- D. Samples: for each product specified 2 sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- E. Maintenance Data: Methods for maintaining and cleaning roller shades, and instructions for operating hardware and controls.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. MechoShade Systems, Inc. (Basis of Design)

2.2 SHADE CLOTH

- A. Visually Transparent Single-Fabric Shadecloth: MechoShade Systems, Inc., EuroVeil "5300" or EuroTwill "6000" Series: 0.010 diameter (0.254 mm) non-raveling vinyl/polyester yarn, fabric thickness 0.025 inches (0.635 mm).
 - 1. Dense Basket Weave "5300" series, 5 percent open.
 - 2. Extra Dense Twill Weave "6000" series, 2-3 percent open.
 - 3. Color: Selected from manufacturer's standard colors.

2.3 SHADE BAND

- A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 - 2. Shade band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
 - c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" "snap off" spline mounting, without having to remove shade roller from shade brackets.
 - d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - e. Any method of attaching shade band to roller tube that requires the use of adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.4 SHADE FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

- B. Fabricate shadecloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
1. Bottom hem weights
 2. Concealed hemtube.
 3. Exposed hemtube.
 4. Exposed blackout hem bar with light seal.
 5. Exposed blackout hem bar with polybond seal.
- C. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- D. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands.
- E. Provide battens for railroaded shades when width-to-height (W: H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.
- F. Blackout shade bands, when used inside channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in an integrally-colored fabric to match the inside and outside colors of the shade band, in accordance with manufacturer's published standards for spacing and requirements.
1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.
 2. Batten pockets shall be self-colored fabric front and back RF welded into the shadecloth. A self-color opaque liner shall be provided front and back to eliminate any see through of the batten pocket that shall not exceed 1-1/2 inches (38.1 mm) high and be totally opaque. A see-through moiré effect, which occurs with multiple layers of transparent fabrics, shall not be acceptable.

2.5 COMPONENTS

- A. Access and Material Requirements:
1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
 3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and/or polyester, or reinforced polyester will not be acceptable.

- B. Manual Operated Chain Drive Hardware and Brackets:
1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
 2. Provide hardware capable for installation of a removable fascia, or both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascia to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
 4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
 7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
 8. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
 - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8-inch (9.525 mm) steel pin.
 - c. The brake shall be an over –running clutch design that disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- C. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.6 ACCESSORIES

- A. Fascia
1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
 2. Fascia shall be able to be installed across two or more shade bands in one piece.
 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
 4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
 5. Notching of Fascia for manual chain shall not be acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.

3.2 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
 - 1. Turn-Key Single-Source responsibility for Motorized Interior Roller Shades: To control the responsibility for performance of the motorized roller shade systems, assign the design, engineering, and installation of motorized roller shade systems, motors, controls, and low voltage electrical control wiring specified in this Section to a single manufacturer and their authorized installer/dealer. The Architect will not produce a set of electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the roller shade installer/dealer, in accordance with the requirements provided by the manufacturer. Coordinate the following with the roller shade installer/dealer.
 - 2. Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer's requirements, as indicated on the mechanical and electrical drawings.
 - 3. Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
 - 4. Roller shade installer/dealer shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer.
 - 5. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controller, and provide and run low voltage control wiring from motor controllers to switch/control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.
 - 6. Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.3 SCHEDULE

- A. Roller Shade Schedule:
 - 1. Shade Type 1: Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.

3.4 CLEANING

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 12 3661
SOLID POLYMER FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes the fabrication and installation of Solid Polymer counter-tops, panels, sinks and other components as shown on Drawings and as specified herein.

1.2 REFERENCES

- A. ANSI Z124.3 - American National Standard for Plastic Lavatories
- B. ANSI Z124.6 - American National Standard for Plastic Sinks
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
- D. ISO 4586-2 - High-pressure Decorative Laminates (HPL, HPDL)
- E. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
- F. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30°C and 30°C with a Vitreous Silica Dilatometer
- G. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- H. ASTM D2565 - Standard Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications
- I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- J. ASTM G22 - Standard Practice for Determining Resistance of Plastics to Bacteria
- K. Federal Specification WW-P-541E/GEN - Plumbing Fixtures
- L. NEMA LD 3 - National Electrical Manufacturer's Association; High Pressure Decorative Laminates

1.3 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Provide product and fabrication information illustrating compliance with specified performance requirements.
- C. Samples: Submit two (2) samples, each 12 inches square, illustrating each selected surfacing material in specified color, pattern, and finish.
- D. Submit manufacturer's care, maintenance, repair and cleaning instructions in project close-out documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Provide Solid Polymer fabrications from the manufacturers below, or prior approved equal.
 - 1. Dupont (Corian)
 - 2. Wilsonart (Solid Surface)

2.2 MATERIAL

- A. Polymer Sheet: 1/2 inch thick homogenous cast sheet meeting ANSI Z124.3 or ANSI Z124.6, Type Six, and Fed. Spec. WW-P-541E/GEN. Material shall have the following minimum physical and performance properties.
 - 1. Surface burning ASTM E84: Flame spread < 25, Smoke developed < 25.
 - 2. Liquid Absorption, ISO 4586-2: 0.4 percent after 2 hours boiling water.
 - 3. Tensile Modulus, ASTM D638 Nominal: 500,00 pounds per square inch.
 - 4. Thermal Expansion, ASTM D696: 3.0×10^{-5} inch per inch per degree F max
 - 5. Hardness, ASTM D2583, Barcol Impressor: 56, Rockwell "M" scale: >85.
 - 6. Flexural Modulus: ASTM D790: 1.2×10^6 psi.
 - 7. Deflection Temperature under load: ASTM D648: 90 degrees C.
 - 8. Stain Resistance, ANSI Z124.6 modified, Method 3.4: No effect.
 - 9. Boiling Water Resistance, NEMA LD 3, Method 3.5: No effect.
 - 10. High Temperature Resistance, NEMA LD 3-1995, Method 3.6: No effect.
 - 11. Radiant Heat Resistance, NEMA LD 3, Method 3.10: No effect.
 - 12. Light Resistance, NEMA LD 3, Method 3.3: No effect.
 - 13. Ball Impact Resistance, NEMA LD 3, Method 3.8, one half pound ball, unsupported: 125 inches.
 - 14. Specific Gravity: 0.977 ounces per cubic inch (1.69 grams per cubic centimeter).
 - 15. Approximate weight: 4.2 pounds per square foot (20.5 kg/square m) per 1/2 inch thickness.
 - 16. Weatherability, ASTM D2565: Pass.
 - 17. Fungus Resistance, ASTM G21: Pass.
 - 18. Bacterial Resistance, ASTM G22: Pass.
 - 19. Pittsburgh Protocol Toxicity: 66.9 grams.
 - 20. Impact Resistance, NEMA LD3 (1/2 lb. Ball) SSV bonded to substrate*** Method 3.08 modified. 125 inches (No Failure).
 - 21. Patterns and Finishes: Provide as shown on drawings.
- B. Joint adhesive: Manufacturer's standard two-component adhesive kit to create inconspicuous, non-porous joints, and with a chemical bond.
- C. Sealant: Manufacturer's standard mildew-resistant, FDA compliant, NSF-51 compliant, UL listed silicone sealant in colors matching components.

2.3 FABRICATION

- A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's requirements.
- B. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2 inch wide reinforcing strip of solid polymer sheet under each joint.
- C. Provide holes and cutouts for plumbing and accessories as indicated on drawings.
- D. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

- E. Finish: All surfaces shall have a matte (gloss rating of 5-20) uniform finish.
- F. Thermoforming: Comply with forming data from manufacturer.
- G. Cove backsplashes: Fabricate 1/2-inch radius cove at intersection of counters and backsplashes. Form backsplashes using 1/2 inch thick sheet. Fabricate in shop or field.

PART 3 EXECUTION

3.1 PREPARATION

- A. Examine all surfaces to receive Work of this Section. Check work of other trades that abuts, adjoins or is affected by work under this section. Commencement of Work will be construed as acceptance of all conditions.
- B. Surface preparation: Precondition surfacing materials and surfaces to receive surfacing materials in accordance with manufacturer's printed installation instructions.

3.2 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawing and product installation details.
 - 1. Provide product in the largest pieces available. Anchor securely to base cabinets or other supports.
 - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Exposed joints/seams shall not be allowed.
 - 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
 - 4. Cut and finish component edges with clean, sharp returns.
 - 5. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
 - 6. Carefully dress joints smooth, remove surface scratches and clean entire surface.
 - 7. Install countertops over 3/4" plywood (marine grade used within 24" of sinks).
 - 8. Install countertops with no more than 1/2-inch (3 mm) sag, bow or other variation from a straight line.
 - 9. Install sidesplashes using manufacturer's standard, color-matched, silicone sealant.

3.3 CLEANING

- A. Clean all surfaces with recommended cleaning products/methods removing all foreign materials, dirt, etc. and polish using methods approved by manufacturer.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Conditions of the Contract including the General Conditions, Supplementary Conditions, and Division One, apply to all work of this Division, whether attached or not.
- B. The requirements specified in this Section shall be applicable to work specified in other Sections within this Division.

1.2 SCOPE OF WORK

- A. All Division 21 sections of these specifications shall include all labor and material to complete the entire fire suppression systems as specified and shown on the Drawings. All work shall be fully compliant with NFPA 13, 14, 24 Owner's Insurance Carrier and Local Authority having jurisdiction.
- B. All work shown and specified shall be completely installed and connected by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner and Owner's Representative.
- C. Provide all services and perform all operations required in connection with, or properly incidental to, the construction of complete and fully operating systems with all accessories as herein specified and shown on the Drawings.
- D. Refer to "Conditions of Work" in Division 1

1.3 QUALITY ASSURANCE

- A. The manufacturer shall be a firm regularly engaged in the manufacture of fire protection equipment and accessories of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. The installer shall be a firm with at least two (2) years of successful installation experience on projects with fire protection equipment and piping similar to that required for this project.

1.4 GENERAL

- A. The accompanying Drawings show diagrammatically the general routing and location of the various equipment items and the major interconnecting piping and equipment and backflow preventers, as required by local authority having jurisdiction, without showing exact details as to elevations, offsets, control lines, and other installation details. The Contractor shall carefully lay out his work to conform to the site conditions, to avoid obstructions, provide proper grading of lines and fully comply with NFPA 13, 14, 24, Owner's insurance carrier and local authority having jurisdiction. Exact locations of outlets, apparatus, and connections thereto shall be determined by reference to the Drawings, reviewed Shop Drawings, including equipment drawings, and rough-in drawings, by measurements at the building, and in cooperation with work specified in other sections of these specifications. Minor relocations necessitated by the conditions at the site or directed by the Architect shall be made without any additional cost to the Owner.

- B. Coordinate the proposed routing of the main sprinkler lines with the Architect's drawings, including the reflected ceiling plans, and interior building elevations. Do not route the main sprinkler lines exposed unless indicated on the plans.
- C. These specifications and the accompanying Drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. Contractor shall coordinate the proper fitting of all material and apparatus into the building and shall prepare larger scale installation drawings for all critical areas, areas with limited working clearances, and areas of significant congestion requiring a higher level of coordination illustrating the installation of work specified in Division 21 in relation to all other portions of work specified in other Sections of these Specifications. Interferences with other portions of work, or the building structure, shall be corrected before any work proceeds. Should changes become necessary on account of the failure of the Contractor to comply with these stipulations, Contractor shall make all necessary changes at no expense to the Owner.
- D. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.
- E. It is the intent of the Contract Documents to provide an installation complete and operational in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section, or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems and required to complete the installation.
- F. Contractor sets forth that all personnel have the necessary technical training and ability; and that all work specified in this Division will be installed to the best standard of each trade, and will be complete and in good working order. If any of the requirements of the Drawings and specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, report same to the Architect promptly after discovery of the discrepancy.
- G. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.5 EXAMINATION OF THE SITE

- A. Contractor shall visit the site, verify all items indicated on the Drawings or specified, and familiarize himself with the work conditions, hazards, grades, actual formations, soil conditions, points of connection, utility locations, and local requirements.
- B. Contractor shall take these conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.
- C. All site visits shall be coordinated and scheduled with the Owner.

1.6 CUTTING AND PATCHING

- A. Excessive cutting of the building structure, walls, floors, ceilings, roof, etc., will not be permitted. No structural member shall be notched or cut unless specifically shown on the Drawings, or unless such cutting is authorized by the Architect.
- B. Provide for all holes or openings of proper size and shape as may be necessary for the proper installation of work specified in Division 21, consulting with the Architect regarding proper locations and sizes.

- C. Where deemed necessary, and after consulting with the Architect, perform all cutting and patching required for the installation of piping, ductwork, etc. This shall include the cutting of concrete floors, concrete and tile floors, walls, ceilings, roofs, etc. It shall also include patching them as required to restore work to match existing finishes, following installation, testing, backfilling, insulation, etc.
- D. Holes through concrete shall be drilled with "Mole", "Core-It", or other diamond point hole saw.
- E. Refer to Division 01, Cutting and Patching.

1.7 CODE REQUIREMENTS

- A. Contractor is required to comply with the requirements of all National, State, local codes and utility companies having jurisdiction and Owner's Insurance Carrier. In no case does this relieve the Contractor of the responsibility of complying with the requirements of these specifications and Drawings where specified conditions are of higher quality than the requirements of the above specified offices. Where requirements of the specifications and Drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices and shall notify the Architect promptly.
- B. Contractor shall comply with the requirements and standards set forth by, but not limited to, the following:
 - 1. (NFPA) National Fire Protection Association.
 - 2. (OSHA) Occupational Safety and Health Administration.
 - 3. (NEC) National Electric Code.
 - 4. Local Plumbing Code.
 - 5. Local Building Code.
 - 6. Local Mechanical Code.
 - 7. Local Fire Code.
- C. Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. Fees and costs incidental to these permits, inspections, and approvals must be assumed and paid by the Contractor.

1.8 RECORD DRAWINGS

- A. Contractor shall, during the execution of work, maintain a complete set of "Record Drawings" upon which all locations of equipment, ductwork, piping, and all deviations and changes in the work shall be neatly recorded for use in producing "As Built" at Project Close-Out. This shall include the incorporation of all Supplemental Drawings issued during the Construction Period.
- B. All "Record Drawings" shall be reviewed monthly during the Construction Period, along with the monthly Pay Application Request.
- C. Refer to Division 01, Execution and Close-Out Requirements.

1.9 RECORDS AND INSTRUCTIONS FOR OWNER

- A. Accumulate during the job's progress the following sets, in triplicate, in accordance with the provisions of Division 01, Execution and Close-Out Requirements:
 - 1. Warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
 - 2. Equipment and fixture brochures, wiring diagrams, and control diagrams.
 - 3. Copies of reviewed Shop Drawings, and material and equipment submittals. Copies of rejected submittals and Shop Drawings are not to be provided.

4. Operating instructions for fire protection systems. Operating instructions shall include recommended maintenance and testing procedures.
 5. Other data and drawings required during construction.
 6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
 7. Valve tag charts and diagrams specified elsewhere herein.
 8. "As-Built" Record Drawings shall be provided in electronic format on a CD (provide two (2) copies) in a PDF or DWG format as determined by the Owner.
 9. Provide copies of all City Inspection Certificates of Approval.
 10. Provide Contractor's Certification Statement that all equipment furnished and all work performed is in compliance with all applicable codes referenced in these specifications, or those which are currently in effect.
- B. Provide not less than one (1) day of operating instructions per building, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of all equipment.
 - C. All of the above data should be submitted to the Architect for approval at such time as the Contractor asks for his last payment request, just prior to his final payment request. In no case will any portion of retainage be released until these documents are submitted and accepted.
 - D. Refer to related portions of Division 1 for Project Close-Out requirements, Operation and Maintenance Data, Warranties, and other related certificates.

1.10 SHOP DRAWINGS AND SUBMITTALS

- A. Contractor shall submit to the Architect shop drawings, product submittals, and catalog data on all equipment, devices and materials designated on the Drawings and specified herein. Electronic PDF copies of each shall be submitted.
- B. Each submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgment of compliance does not relieve the Contractor from responsibilities for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all dimensions for proper fit of all parts of the work and performance of all equipment supplied to meet specification requirements are, and remain, specific responsibilities of the Contractor.
- C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary; and, should there be any charges in connection with this, they shall be borne by the Contractor.
- D. Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered and accessories as specified.
- E. Shop Drawings are not intended to cover detailed quantitative lists of heating specialties, valves, air distribution devices, fixtures, and similar items, as the Drawings and specifications illustrate those items; and it is the Contractor's responsibility to procure the proper quantities required to comply with the established requirements.

- F. Shop Drawings prepared to illustrate how equipment, piping, equipment, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified the conditions shown. Review by the Architect shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Shop Drawings.
- G. Various material submissions of such items as shown valve assemblies, backflow preventers, and other related items or accessories shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets. Cover sheets for each item submitted shall have sufficient bare space to allow for shop drawing review stamps
- H. Contractor shall process his submitted data to insure that it conforms to the requirements of the Drawings and specifications, and there are no omissions and/or duplications.
- I. Shop Drawings and Submittals shall be accompanied by certification from the Contractor, and firm preparing such, that Shop Drawings have been checked for, and are in compliance with, the Contract Documents, NFPA, Owner's Insurance Carrier and local authority having jurisdiction.
- J. All Submittals and Shop Drawings shall have been submitted for review by the Architect and Engineer within 90 days after Contract Award Date.

1.11 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

- A. Seal voids around ducts and pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Section 07 84 00, Fire-Stopping.

1.12 DRAWINGS

- A. Drawings show diagrammatically the locations of the various pipes, valves and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in full cooperation with work specified in other Divisions of these specifications; and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.
- B. Should any changes be deemed necessary in items shown on the Contract Drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.
- C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention prior to bids being submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate the installation of any particular apparatus.
- D. Lay out all work maintaining all lines, grades, and dimensions according to these Drawings with due consideration for the work of others. Verify all dimensions at the site prior to any fabrication or installation. Should any conflict develop or installation be found impractical, the Architect shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.
- E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or

tabulation of the various units of materials and work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.13 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

- A. Equipment supplied as portions of work specified under other Divisions of these specifications shall be furnished with proper roughing-in diagrams and shall be installed as a part of Division 21.
- B. Furnish materials and labor required for the connection of this equipment.
- C. Contractor shall ascertain that all equipment so specified is included as part of this work.

1.14 COOPERATION

- A. Coordinate all work indicated in Division 21 with work specified in other Divisions to assure proper and adequate interface with other portions of the work.
- B. Maintain contact and be familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed. Install the required systems in their several stages, at the proper time to expedite the work and avoid unnecessary delays in the progress of other portions of the work.
- C. Should any questions arise between work specified in Division 21 with respect to other portions of work specified in other Divisions of the Specifications, reference shall be made to the Architect for instructions.

1.15 MATERIALS AND EQUIPMENT

- A. All materials and equipment purchased shall be new. No used or reconditioned equipment will be allowed unless specifically noted on the Drawings.
- B. All material shall be manufactured in the United States and/or shall comply with the North America Free Trade Agreement, NAFTA.
- C. Substitutions: Products of same functions, performance and design will only be considered if in full accordance with the requirements of Division 01, Product Requirements. The products of other manufacturers will be acceptable; only if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency, maintainability, and dependability, the purpose for which the items specified were intended.
- D. Listed Manufacturers:
 - 1. Manufacturers listed in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements, and are listed therein to establish a standard.
 - 2. The "listing" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
 - 3. Products offered by listed manufacturers shall be equal to, or superior in all respects to, that specified by named products; and shall meet or exceed specification requirements.
 - 4. The description of specific qualities takes precedence over the reference standards and the description of qualities and reference standards together take precedence over the named product of listed manufacturers.
- E. Product Options:

1. Products specified only by Reference Standards or by Description only means that any product meeting those standards or descriptions, by any manufacturer, will be considered.
2. Products specified by naming several products or manufacturers means that only the manufacturers named will be considered.
3. Products specified by naming only one product and manufacturer means that no option exists unless a substitution is accepted. Submit a request for substitution for any product or manufacturer not specifically named.
4. Products specified by Description, Reference Standard, and naming several products or manufacturers means that any product and manufacturer named meeting those descriptions and standards will be considered. Submit a request for substitution for any product or manufacturer not specifically named.

F. Limitations or Substitutions:

1. During Bidding Period, Instructions to Bidders, in Division 1, will govern times for submitting requests for substitutions under requirements specified in this Section.
2. No later than ten (10) days prior to the bid date, Contractor shall notify the Architect in writing of any desired substitutions of products in place of those specified. These requests will be considered; and, if a favorable response is determined, this will be documented in the form of an Addenda.
3. Substitutions will not be considered when indicated or implied on Shop Drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
4. Substitute products shall not be ordered or installed without written acceptance.
5. Only one request for substitution for each product will be considered. If substitution is not accepted, Contractor shall provide specified product.
6. Architect will determine acceptability of any and all substitutions.

G. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior, as the Architect is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturer's engineering data, specification sheet, and a sample, if practical or if requested or specified. In no event shall a proposal for substitution be cause for delay of work. This shall include a detailed comparison to each product specification paragraph.

H. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

I. No substitutions will be considered contingent upon pending certification and rating agency approvals. Such certifications and ratings shall be in effect at the time of bidding.

1.16 EQUIPMENT SIZES AND REQUIREMENTS

A. Space allocations in machinery and mechanical equipment spaces are based on equipment scheduled in each case. Should the Contractor request a substitution for equipment of another make that requires more space in any critical dimension, the Contractor shall submit, together with other submittal data on the equipment, prints of drawings indicating how the equipment may be installed, indicating room for servicing and revisions in piping or ducting and any other details necessary for the Architect to form a judgment as to the suitability of the substitute material, as to performance, suitability for the space and other variables.

- B. Duties of certain equipment items, horsepower's of driving motors and electrical characteristics are scheduled for equipment items of a particular make in each case. Should requests for a substitute material be accepted which has other requirements that would involve allied equipment or other portions of work, the Contractor shall be responsible for all modifications required at no change in contract price. As examples:
 - 1. If an accepted fire pump has a brake horsepower requirement above the motor horsepower scheduled, the Contractor shall be responsible for providing a larger motor and heavier drive and any change in size of the protective device, conduit run and conductors serving that motor. The latter shall be extended through an individual branch protective device and branch circuit on through the panel, feeder, feeder protective device, etc.
 - 2. If accepted, fire pump, etc., having greater pressure drops than those on which pumping heads were based, the Contractor shall be responsible for selecting proper pumps and drives and adjusting electrical service work accordingly.
- C. Structural steel members are indicated to provide supports for certain specific sizes and weights of equipment. Should a substitution request involve other equipment, the spacing of the supports shall be varied to suite the equipment. Should the weight or size of a proposed substituted item of equipment require additional supporting steel members, the Contractor shall include documentation of the additional supports in the request for substitution and install them at no change in contract price if the substitution is accepted.
- D. Various large apparatus to be installed may require that the apparatus be installed prior to the installation of portions of structural, walls, or door frames. Coordinate the installation of these items to insure that no demolition of general construction is necessary for equipment installation or that the apparatus does not have to be disassembled for installation.

1.17 STORAGE AND PROTECTION OF MATERIALS

- A. Store and protect materials and equipment as specified in Division 01, Product Requirements.
- B. Contractor shall provide storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, and as directed by the Architect. In no case, shall storage interfere with traffic conditions in any public or project thoroughfare.
- C. All work and material shall be protected at all times. Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all mechanical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.
- D. On site storage shall not be inside the building during construction progress, but shall be in approved trailers or as specifically approved otherwise by the Architect. Storage inside the building shall only be allowed when so allowed by the Architect.

1.18 FOUNDATIONS

- A. Provide equipment foundations associated with the work specified in Division 21.
- B. All top corners and edges of all foundations shall be neatly chamfered at a one inch (1") high 45 degree angle.
- C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") below the equipment bases for alignment, leveling, and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the

grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary.

- D. After removal of the forms, the surface of the foundation shall be rubbed until smooth.
- E. Unless otherwise noted, foundations shall be four inches (4") thick for fire pumps and motors and other mechanical equipment, unless thicker foundations are required or recommended by the equipment manufacturer.
- F. All concrete work shall conform to the requirements of Division 03, Cast-in-Place Concrete.
- G. Provide housekeeping pads and foundations for every item of floor mounted equipment specified in Division 21 specifications. Pads shall extend a minimum of two inches (2") in each direction beyond the equipment size.

1.19 EXCAVATION AND BACKFILLING

- A. Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground conduits shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the piping and refilled to grade as specified. After the piping has been installed and reviewed by Architect and local building authorities, trenches shall be backfilled to grade with approved materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by Architect shall be a part of this contract.
- B. Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet (5') in depth, Contractor shall pay a qualified engineer to prepare detailed Drawings and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project contract Documents.

1.20 WIRING

- A. Unless otherwise noted, all wiring for motors, starters, and equipment is specified in Division 26.
- B. Wiring of temperature controls shall be performed in accordance with the requirements of Division 26 but shall be performed as outlined in other sections of these specifications.
- C. All power for control circuits required for the Fire Sprinkler System shall be provided and installed where indicated on the Division 26 Drawings, but shall otherwise be provided as indicated in other sections of these specifications.
- D. Each supplier of equipment requiring control shall have wiring diagrams furnished with submittals. This shall be used to determine conduit layouts required to complete the electrical portions of the instrumentation and control systems.
- E. All motors furnished as a portion of work specified in Division 21 shall be wired as specified in Division 26.

- F. Except where combination starter-disconnects are specified elsewhere herein or in Division 26, all motors shall be provided with safety disconnect switches in accordance with the National Electrical Code as specified in Division 26.
- G. Furnish all necessary wiring diagrams for equipment specified in Division 21, as a part of equipment submittals, for installation under other sections of these specifications.

1.21 EQUIPMENT STANDARDS

- A. All basic materials and equipment shall be standard catalog products of a reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year.
- B. First of a kind new technology devices will not be considered.
- C. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic materials or equipment shall carry the guarantee of the basic material or equipment manufacturer and repair and replacement parts shall be available through normal trade channels locally.

1.22 CLEAN UP

- A. Contractor shall be responsible for cleaning up after and during all work performed under this Division of the Specifications.
- B. Contractor shall, on a daily basis, remove construction trash and debris accumulation to minimize the entrance of dust, dirt, and debris in piping, ductwork, and mechanical equipment.
- C. At the completion of construction, just prior to Substantial Completion and sustained operation of equipment, thoroughly clean the inside of piping, valve assemblies, and devices.
- D. Refer to Division 1.

1.23 FINAL CONSTRUCTION REVIEW

- A. Schedule: Upon completion of the work specified in Division 21, there shall be a final construction review of the completed systems installations. Prior to this walk-thru, all work specified in this Division shall have been completed and tested, in its final operating condition and the preliminary test report shall have been submitted to and approved by the Architect.
- B. Personnel: A qualified person representing the Contractor must be present at this final construction review to demonstrate the system and prove the performance of the equipment.
- C. Exceptions to the aforementioned requirements will be considered on a case-by-case basis dependent on the size and type of project, as well as construction schedule limitations.

1.24 CERTIFICATIONS

- A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.
- B. Provide copies of all applicable approved notices and inspection certifications from the various inspections conducted by the Local Code Enforcement Authorities.

1.25 GUARANTEE

- A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance, Substantial Completion, or as defined by Extended Warranty Contracts. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance.
- B. The Contractor shall also guarantee that the performance of all equipment furnished and installed under this Division of the Specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not operating as intended, the Contractor shall make further tests as the Owner's Representative may direct to demonstrate that the equipment installed meets the specifications and is delivering the capacity specified or called for on the Drawings.
- C. If there is any indication that the equipment does not meet the specified quantities, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to employ recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

END OF SECTION

SECTION 21 1300

COMBINED WET FIRE SPRINKLER AND STANDPIPE SYSTEM

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with Division 21 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to, the providing of fire protection systems which shall include the automatic wet pipe sprinkler system and interior Fire Department valves in cabinets as shown on the Drawings and as approved by the Local authorities having jurisdiction for the new or renovated building.
- B. The extent of Fire Sprinkler piping work is not indicated by drawings and schedules. The successful Sub-Contractor shall prepare and submit drawings and schedules for approval by the requirements of this section and is hereby defined to include (but is not necessarily limited to) purchase and complete installation of alarm check valves and trim, feed and cross main piping, branch line piping, test valves, test conditions and sprinklers, double check backflow preventer assembly and inside Fire Department valve connections as required by local authorities. Fire Sprinklers, interior fire department valves and standpipes in stairwells shall be installed to serve the entire Building Complex.
- C. A sprinkler layout is not shown on the plans. The successful Sub-Contractor shall prepare shop drawings for the hydraulically designed sprinkler system and secure approval of same from the Owner's Insurance Carrier, I.S.O. Commercial Risk Services Group representing the Texas State Insurance Authorities Review Board, and Local City Authorities. Approved plans and submittals shall be submitted to the Owner's Representative for approval before any materials are fabricated.
- D. The Sprinkler Systems shall be fed by one (1) sprinkler valve assemblies. The system shall be limited to a maximum of 52,000 square feet per floor in accordance with NFPA-13 and 14, and International Fire Code. The Sub-Contractor shall extend the sprinkler system piping to the property line or as shown on the drawings. Sub-Contractor shall coordinate with others to provide the City water tap.
- E. The Contractor shall obtain from the City a current water flow test close as possible to the proposed building addition use this information for the basis of design of the hydraulically calculated system. Flow test shall have been taken in the last six months. Should a current flow test not be available, the Contractor shall conduct the test in the presence of the local fire department representative. This information shall be used for the basis of design of the hydraulically calculated system.
- F. The Contractor shall comply with NFPA 13, "Water Supply Treatment" in areas with water supplies known to have contributed to Microbiologically Influenced Corrosion (MIC) of sprinkler piping. The Contractor shall provide an Alternate Bid for testing and appropriately treating the water supply.
- G. The Contractor shall obtain, from the City, a water flow test as close as possible to the proposed building site. The test shall have been taken within the last six months and this information shall be used for the basis of design of the hydraulically calculated system.

- H. The sprinkler system shall be designated to meet the hydraulically most remote requirements. Provide GPM density and remote area square footage as required by Owner's Insurance Carrier and by NFPA Standards. (The most stringent shall be used).
- I. In addition to the requirements of the governing authorities, the following design criteria shall be met:
 - 1. A 10 psig safety factor shall be designed into all the hydraulic calculations.
 - 2. The maximum velocity in the pipes shall not exceed 32 ft./sec.
 - 3. Head spacing shall not exceed 400 sq. ft. for light hazard areas and 130 sq. ft. for ordinary hazard areas such as mechanical rooms. Head spacing shall be further restricted by ceiling type where appropriate per NFPA-13. Extended coverage heads may be used only where noted.
 - 4. A main drain shall be provided next to the main sprinkler/standpipe riser.
 - 5. Floor openings shall be protected by closely spaced sprinkler heads in combination with draft stops as required by NFPA 13.

1.3 QUALITY ASSURANCE

- A. The manufacturer shall be a firm regularly engaged in the manufacture of fire protection equipment and accessories of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.
- B. The installer shall be a firm with at least two (2) years of successful installation experience on projects with fire protection equipment and piping similar to that required for this project.
- C. The Contractor shall be licensed by the Texas Commission on Fire Protection for sprinkler installation and shall have five (5) years experience installing sprinkler systems of this size and scope. The contractor shall provide evidence of these requirements upon request. The contractor shall have an established service organization within a 50 mile radius of the job site.
- D. FM Compliance: Comply with Factory Mutual "Approval Guide".
 - 1. FM approvals Marks: Provide units bearing FM approval marks.
- E. UL Labels: Provide units which have been approved and listed by Underwriter's Laboratories.
- F. Comply with NFPA Standards, Governing Fire Prevention Code, Local Regulations and Ordinances governing fire sprinkler piping.
- G. Coordinate with fire alarm installation for required monitoring of the sprinkler system.
- H. All material shall be manufactured in the United States and/or shall comply with the most current North America Free Trade Agreement, USMCA. Any materials installed that are not manufactured in the United States and/or comply with USMCA shall be removed and replaced at the contractor's time and expense, without exception. In addition, this removal and replacement shall not delay the project schedule.

1.4 GOVERNING AUTHORITIES

- A. Each combined standpipe and automatic sprinkler system shall comply with applicable State and City codes, with the requirements of other authorities having jurisdiction, and with the requirements of NFPA-13 and NFPA-14.
- B. Comply with all requirements of the Owner's Insurance Carrier, and the City Authorities. Provide sprinkler products bearing approval from Underwriter's Laboratories.

1.5 SUBMITTALS

- A. Submit coordinated shop drawings and details of each fire protection system to, and receive approval from, the governing authorities before the submittal is forwarded to the Owner's Representative, and before installation work is started. Refer to Section 21 05 00 and appropriate Architectural section.
- B. Submit to the Owner's Representative, upon completion of each system, a certificate stating that the work has been completed and tested in accordance with NFPA-13, that there are no defects in the system, and that it is operational. Test procedures and certificate format shall be in accordance with NFPA-13 and NFPA 14 unless otherwise directed by the governing authorities.
- C. Submit to the Owner's Representative upon completion of the system, manufacturer data of all products incorporated in this work.
- D. Submit the following Products Data, Shop Drawings and Samples:

	Product Data	Shop Drawings	Samples
Heads	X	X	
Valves	X	X	
Hangers	X	X	
Jointing Method	X		

1.6 MAINTENANCE STOCK, FIRE SPRINKLERS

- A. Maintenance Stock: For each style and temperature range required, furnish an additional two (2) fire sprinklers, cover plates and escutcheons, for every 100 units installed, but not less than six (6) units of each type and twelve (12) concealed sprinkler covers of each type.

1.7 COORDINATION

- A. The Sub-Contractor shall examine all other work shown on the plans and such work installed at the job site. The sprinkler system Sub-Contractor shall coordinate the routing of his work with the other construction trades to avoid interference with the other installations. Pipe routing shall be located as required to avoid equipment, plumbing drain pipe, heating and air conditioning piping, ductwork, light fixtures, and electrical buss ducts. This Sub-Contractor shall provide pipe offsets, etc., as required to complete the installation. Shop prefabricated piping, pipe hangers, etc., shall be modified as required to fit the job site conditions.
- B. Coordinate routing of sprinkler piping and head locations in large volume spaces with architect's plans, including elevations. Routing of piping to be concealed where possible. Architect to review routing of mains piping and head locations in these spaces during shop drawing review.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Cover and protect materials in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall be rejected.
- B. Storage and protection of materials shall be in accordance with Section 21 00 00.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials shall comply with the requirements of NFPA-13 and 14, Owner's insurance carrier/ I.S.O. Commercial Risk Services Group, U.L., FM, and Section 21 05 00.

2.2 PIPE AND FITTINGS

- A. Underground within 5'-0" of the Building:
 - 1. Type: AWWA C151, Class 52 cement lined, ductile iron.
 - 2. Wrapping: Buried pipe wrapped with 8 mil polyethylene encasement, AWWA C105.
 - 3. Buried Fittings (size 4 inch through 12 inch): Ductile iron compact type with push-on joints, ANSI A21.53/AWWA C153, or standard fittings, AWWA C110. Use mechanical joints with retainer glands where required for complete system. Equal to Tyco or Victaulic.
 - 4. Underground riser, welded 304 stainless steel one-piece riser assembly with flanged end and tie-rod bracket, UL and FM approved, AMES Model "1 BR Series".
- B. Underground 5'-0" beyond the Building: Pressure Class 200, polyvinyl chloride (PVC) water pipe conforming to ASTM D-2241, AWWA C-900 D.R. 14 with cast iron pipe outside dimension requirements of size indicated. Fittings shall be cast iron conforming to ANSI A21-10.
- C. Above Grade, Indoor Piping 1-1/2 Inch and smaller: ASTM A-53/135, Schedule 40, black steel pipe, piping by Bull Moose, Allied, or Wheatland Tube. Provide fittings as follows:
 - 1. Pipe Size 1-1/2 Inch and Smaller: Class 150 malleable iron, threaded fittings, ANSI B16.3.
 - 2. Fittings: Acceptable manufacturers: Tyco, or Anvil.
- D. Above Grade, Indoor Piping 2 inch and larger: ASTM A-53/135, Schedule 10, black steel pipe, piping by Bull Moose, Allied, or Wheatland Tube. Provide fittings as follows:
 - 1. Size 2 Inch and Larger: UL listed mechanical grooved couplings with flush sealed gasket style equal to Victaulic "AWWA Flush Seal".
 - 2. Fittings: Acceptable manufacturers: Victaulic, Tyco, or Anvil.
- E. No Mechanical Tees shall be installed.
- F. Outdoors or Exposed to Moisture: Same as specified for "Above Grade, Indoor Piping", except pipe shall be hot dipped galvanized.
- G. Fire Sprinkler Drain Piping:
 - 1. Pipe size 2" and smaller: Black steel pipe and fittings: Pipe weight: Schedule 40; Fittings: Class 125 cast iron screwed; Fittings: Class 150 malleable iron, screwed.
 - 2. Pipe size 2-1/2" and larger: Black steel pipe and fittings: Pipe weight: Schedule 40; Fittings: Wrought iron or Schedule 10, rolled-grooved couplings and fittings.

2.3 PIPE SLEEVES

- A. Pipe sleeves through grade beams or ground floor slab shall receive "Link Seal" closures made of interlocking synthetic rubber links. Seals shall provide for absolute water tightness. Seal shall be constructed to insulate electrically pipe from wall. Install as

recommended by manufacturer. Provide Century-Line sleeves with water stop and anchor collar for pipes penetrating grade beams designated to be anchored.

2.4 VALVES

- A. General: Conform to the requirements of NFPA-13 and NFPA-14.
- B. Check Valves: Provide Victaulic "FireLok" 717 Series, or Tyco CV-1F, check valves 2-1/2" and larger with automatic ball drips for fire department connections.
- C. Alarm Valve Assemblies: Provide approved alarm valves, 175 LBS rated pressure complete with all variable pressure trim, valves, etc., as required, equal to Tyco CV-1FR.
- D. Sectional Valves: Provide indicating butterfly control valve, BFV-N, 175 LB rated working pressure, of size and end types indicated: 2-1/2" and larger: Tyco or Victaulic "FireLok" 705 Series.

2.5 AUTOMATIC SPRINKLERS

- A. Fire Sprinklers: Provide standard coverage quick-response Bulb-Type, ("O-Ring" water seal design not acceptable) automatic fire sprinklers with 165 Deg.F. or as required by NFPA-13, operating temperature of the following style and finish (all sprinkler heads shall be centered in the ceiling tiles). Acceptable manufacturer's: Tyco, Reliable or Viking.
- B. NOTE: Sprinklers shall be limited to 400 sq. ft. coverage for light hazard and 130 sq. ft. for ordinary hazard area.
 - 1. Upright type in mechanical spaces without ceilings equal to Tyco TY-FRB. Sprinkler Finish: Cast brass (in non-exposed areas) and chrome plated (in occupied areas).
 - 2. Provide fully concealed pendent type in all finished areas with ceiling or soffit with factory painted "off-white" threaded cover plate equal to Tyco Quick Response concealed sprinkler model RFII "Royal Flush II".
 - 3. Provide in heated spaces only exposed chrome plated horizontal and vertical side wall sprinklers equal to Tyco-TY-FRB.
 - 4. Provide in heated spaces only, recessed chrome plated horizontal sidewall sprinklers equal to TYCO series EC.
- C. Emergency Head Storage Cabinet: Provide a red, baked enamel, steel sprinkler cabinet to store the extra sprinklers, wrenches, list of installed sprinklers with Sprinkler Identification Numbers (SIN) in addition to requirements of NFPA-13.

2.6 ACCESSORIES

- A. Tamper Switches: Provide tamper switches equal to Potter Type OSYSU or PCVS Series on all control valves for connection to the fire alarm system.
- B. Water Flow Detectors: Provide a water flow detector equal to Potter Type VSR Series at the main fire protection piping entrance to the building or system, in addition to other locations shown, specified, or required, to detect any flow in the system from any cause. If flow is detected, sound a local alarm. See fire alarm section for connection to fire alarm system.
- C. Pressure Gauges: Provide 3-1/3 inch diameter, Potter-Roemer No. 6240 pressure gauges with stainless steel case and with a range of 0-300 psig, include gauge cock.
- D. Wall Mounted Weather-Proof Horn/Strobe or Water-Motor Gong (As required by local AHJ): Provide wall mounted weatherproof, red finished, 120V exterior horn/strobe UL listed FM approval with back box equal to Potter SH-120 Series or Provide a 10"

weatherproof, red enameled finish, water-motor gong, UL listed, FM approved equal to Tyco WMA-1.

- E. Ball Drips: Provide Tyco AD-2, automatic ball drips for piping between check valves and fire department connections. Extend drain line from each ball drip to point of disposal as shown on the Drawings, or as directed.
- F. Flexible Sprinkler Drops shall only be allowed if they are hydraulically designed in the system calculations. Flex connections shall not exceed 36" in length. Flexible drops shall be braided stainless steel as manufactured by Flex Head or Victaulic VicFlex.
- G. Automatic Air Vents: Provide as required by NFPA 13, shall be UL listed, FM approved rated up to 175 psig. Provide with ball valve and union upstream of the y-strainer. Potter PAV or pre-approved equal.
- H. Hangers and Supports: Provide hangers and supports as required by NFPA-13.
- I. Outside Fire Department Connections:
 - 1. Free standing type device shall be Potter-Roemer No. 5760, 2-way, Fire Department Connection with individual drop clapper valves, plugs, chain, and escutcheon lettered "AUTO.SPKR". Entire unit shall have polished chrome finish, size shall be 2-1/2" x 2-1/2" x 4". Provide "storz" connection as required by local Fire Department equal by Guardian Fire Equipment or Croker.
- J. Double Check Backflow Preventer Assembly:
 - 1. Acceptable manufacturers:
 - a. Watts.
 - b. Apollo.
 - c. Ames.
 - 2. Double check valve type with shutoff valves.
 - a. Quarter turn ball shut-off valves up to 2-1/2 inches.
 - b. Outside stem and yoke gate shut-off valves 3 inches and over.
 - 3. Bronze body construction up to 2-1/2 inches.
 - 4. Cast iron body construction 3 inches and over with stainless steel internal ports and FDA approved fused epoxy coating.
 - 5. Provide in-line upstream y-type strainer.
 - a. 20 mesh strainer 2 inches and below.
 - b. 0.125 perforated screen mesh 2-1/2 inches and over.
 - 6. Acceptable Product: Ames 2000 SS or 2000 SE.

2.7 PROTECTION OF ELECTRICAL EQUIPMENT

- A. Where required, provide metal hoods or shields to protect electrical equipment and bus ducts from sprinkler discharge.
- B. No sprinkler mains or branches shall pass through an Electrical Room, IDF or MDF Rooms.
- C. Only the branch line serving that specific Electrical Room, IDF or MDF Room shall enter that specific room.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install combined standpipe and automatic sprinkler system where shown on the Drawings or as noted. Installation shall comply with the requirements of NFPA-13 and NFPA-14, Local Fire Code, these Specifications, and the governing authorities, and with the manufacturers' written instructions. Coordinate with other work, including plumbing piping, as necessary to interface components of fire sprinkler piping properly with other work.
- B. Welding shall comply with the requirements of Section 21 05 00 and State Insurance Authorities, and NFPA 51B. No butt welds are allowed.
- C. Provide pipe offsets as required. Modify shop pre-fabricated piping, pipe hangers, and other components as required to fit the job site conditions.
- D. Installation of hoods and shields for protection of electrical equipment shall be in accordance with approved details, included as a part of the coordinated shop drawings.
- E. Install sectional valves in inlet piping at the bottom of each riser and in loops as indicated or required.
- F. Install air vents at the high points of the sprinkler piping.
- G. Install a tamper switch on hose connection cabinet door, each sectional valve and on each other shut-off valve.
- H. Install drain piping at all low points of the sprinkler piping.
- I. Thrust blocks shall be of size required for the soil bearing strength and against compacted soil.
- J. Install water flow detectors at each take-off from a sprinkler riser or for each zone.
- K. Install pressure reducing valves as required by NFPA 13.
- L. Install heads in all locations, pendant or upright, as required to provide complete coverage. Sprinkler shall be strictly coordinated with diffusers, grills, lights, ceiling type, and other trades.
- M. Install sprinklers in finished ceilings to be centered on ceiling pattern; center of 2 x 2, or 2 x 4, tiles; centered both ways for special pattern ceilings. Coordinate head locations with ceiling finishes and types. Provide additional sprinklers as necessary for symmetrical layout. Refer to Architectural Reflected Ceiling Plan for ceiling type and suggested head location. Where head locations are not shown, locate as required and submit to Architect for approval prior to installation.
- N. NO MECHANICAL TEES SHALL BE INSTALLED.

3.2 IDENTIFICATION

- A. Apply signs to identify purposes and functions of controls, and to identify drain, test, and alarm valves. Provide letter sizes and styles as selected by the Owner's Representative from NFPA's suggested styles.

3.3 CLEANING AND FLUSHING

- A. Prior to connecting sprinkler piping for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After sprinkler piping installation has been completed, and before piping is placed in service, flush each sprinkler system under

pressure to remove foreign substances as required by NFPA-13 and NFPA-14. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

3.4 TESTS

- A. After flushing each system, hydrostatically test sprinkler piping in accordance with NFPA-13 and NFPA-14. Check system for leakage at joints. Measure hydrostatic pressure at low point of each system or zone being tested.
- B. Repair or replace piping system as required to eliminate leakage in accordance with NFPA Standards, then retest as specified to demonstrate compliance.

3.5 CERTIFICATION

- A. Before final approval of the fire protection systems are requested, provide the Owner's Representative a statement that all requirements of the State Board of Insurance, City Building Inspection, Owner's Insurance and Fire Departments have been met in the installation of the fire protection systems.

END OF SECTION

SECTION 22 0500

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Conditions of the Contract including the General Conditions, Supplementary Conditions, and Division One, apply to all work of this Division, whether attached or not.
- B. The requirements specified in this Section shall be applicable to work specified in other Sections within this Division.

1.2 SCOPE OF WORK

- A. All Division 22 sections of these specifications shall include all labor and material to complete the entire mechanical systems as specified and shown on the Drawings.
- B. All work shown and specified shall be completely installed and connected by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner and Owner's Representative.
- C. Provide all services and perform all operations required in connection with, or properly incidental to, the construction of complete and fully operating systems with all accessories as herein specified and shown on the Drawings.
- D. Refer to "Conditions of Work" in Division 1

1.3 GENERAL

- A. The accompanying Drawings show diagrammatically the sizes and location of the various equipment items and the sizes of the major interconnecting piping and without showing exact details as to elevations, offsets, control lines, and other installation details. The Contractor shall carefully lay out his work to conform to the site conditions, to avoid obstructions and provide proper grading of lines. Exact locations of outlets, apparatus, and connections thereto shall be determined by reference to the Drawings, reviewed Shop Drawings, including equipment drawings, and rough-in drawings, by measurements at the building, and in cooperation with work specified in other sections of these specifications. Minor relocations necessitated by the conditions at the site or directed by the Architect shall be made without any additional cost to the Owner.
- B. These specifications and the accompanying Drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. Contractor shall coordinate the proper fitting of all material and apparatus into the building and shall prepare larger scale installation drawings for all critical areas, areas with limited working clearances, and areas of significant congestion requiring a higher level of coordination illustrating the installation of work specified in Division 22 in relation to all other portions of work specified in other Sections of these Specifications. Interferences with other portions of work, or the building structure, shall be corrected before any work proceeds. Should changes become necessary on account of the failure of the Contractor to comply with these stipulations, Contractor shall make all necessary changes at no expense to the Owner.
- C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

- D. It is the intent of the Contract Documents to provide an installation complete and operational in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section, or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems and required to complete the installation.
- E. Contractor sets forth that all personnel have the necessary technical training and ability; and that all work specified in this Division will be installed to the best standard of each trade, and will be complete and in good working order. If any of the requirements of the Drawings and specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, report same to the Architect promptly after discovery of the discrepancy.
- F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.4 EXAMINATION OF THE SITE

- A. Contractor shall visit the site, verify all items indicated on the Drawings or specified, and familiarize himself with the work conditions, hazards, grades, actual formations, soil conditions, points of connection, utility locations, and local requirements.
- B. Contractor shall take these conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.
- C. All site visits shall be coordinated and scheduled with the Owner.

1.5 CUTTING AND PATCHING

- A. Excessive cutting of the building structure, walls, floors, ceilings, roof, etc., will not be permitted. No structural member shall be notched or cut unless specifically shown on the Drawings, or unless such cutting is authorized by the Architect.
- B. Provide for all holes or openings of proper size and shape as may be necessary for the proper installation of work specified in Division 22, consulting with the Architect regarding proper locations and sizes.
- C. Where deemed necessary, and after consulting with the Architect, perform all cutting and patching required for the installation of piping, etc. This shall include the cutting of concrete floors, concrete and tile floors, walls, ceilings, roofs, etc. It shall also include patching them as required to restore work to match existing finishes, following installation, testing, backfilling, insulation, etc.
- D. Holes through concrete shall be drilled with "Mole", "Core-It", or other diamond point hole saw.
- E. Refer to Division 01, Cutting and Patching.

1.6 CODE REQUIREMENTS

- A. Contractor is required to comply with the requirements of all National, State, and local codes and utility companies having jurisdiction. In no case does this relieve the Contractor of the responsibility of complying with the requirements of these specifications and Drawings where specified conditions are of higher quality than the requirements of the above specified offices. Where requirements of the specifications and Drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices and shall notify the Architect promptly.

- B. Contractor shall comply with the requirements and standards set forth by, but not limited to, the following:

1. (NFPA) National Fire Protection Association.
2. (OSHA) Occupational Safety and Health Administration.
3. (NEC) National Electric Code.
4. (IECC) International Energy Conservation Code.
5. Local Plumbing Code.
6. Local Building Code.
7. Local Fire Code.
8. Local Energy Code.

Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. Fees and costs incidental to these permits, inspections, and approvals must be assumed and paid by the Contractor.

1.7 RECORD DRAWINGS

- A. Contractor shall, during the execution of work, maintain a complete set of "Record Drawings" upon which all locations of equipment, ductwork, piping, and all deviations and changes in the work shall be neatly recorded for use in producing "As Built" at Project Close- Out. This shall include the incorporation of all Supplemental Drawings issued during the Construction Period.
- B. All "Record Drawings" shall be reviewed monthly during the Construction Period, along with the monthly Pay Application Request.
- C. Refer to Division 01, Execution and Close-Out Requirements.

1.8 RECORDS AND INSTRUCTIONS FOR OWNER

- A. Accumulate during the job's progress the following sets, in triplicate, in accordance with the provisions of Division 01, Execution and Close-Out Requirements:
1. Warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
 2. Equipment and fixture brochures, wiring diagrams, and control diagrams.
 3. Copies of reviewed Shop Drawings, and material and equipment submittals. Copies of rejected submittals and Shop Drawings are not to be provided.
 4. Operating instructions for heating and other plumbing systems. Operating instructions shall include recommended maintenance and seasonal change-over procedures.
 5. Other data and drawings required during construction.
 6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
 7. Valve tag charts and diagrams specified elsewhere herein.
 8. "As-Built" Record Drawings shall be provided in electronic format on a CD (provide two (2) copies) in a PDF or DWG format as determined by the Owner.
 9. Provide copies of all City Inspection Certificates of Approval.
 10. Provide Contractor's Certification Statement that all equipment furnished and all work performed is in compliance with all applicable codes referenced in these specifications, or those which are currently in effect.
- B. Provide not less than one (1) day of operating instructions per building, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of all equipment.

- C. All of the above data should be submitted to the Architect for approval at such time as the Contractor asks for his last payment request, just prior to his final payment request. In no case will any portion of retainage be released until these documents are submitted and accepted.
- D. Refer to related portions of Division 1 for Project Close-Out requirements, Operation and Maintenance Data, Warranties, and other related certificates.

1.9 SHOP DRAWINGS AND SUBMITTALS

- A. Contractor shall submit to the Architect shop drawings, product submittals, and catalog data on all piping, equipment, and materials designated on the Drawings and specified herein. Electronic Pdf copies of each shall be submitted.
- B. Contractor shall submit full product data shop drawings and shall prepare and submit 1/4" = 1'-0" scale plumbing piping shop drawings. Contractor shall fully coordinate all piping shop drawings with sheet metal shop drawings and other trades. Failure to submit shop drawings in a timely manner, as required to keep pace with the construction and work of all other trades, will result in delays, and possible stoppage, of payment to the contractor. Additionally, no work may proceed until such shop drawings are submitted, reviewed, and found to be acceptable by the engineer.
- C. Each submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgment of compliance does not relieve the Contractor from responsibilities for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all dimensions for proper fit of all parts of the work and performance of all equipment supplied to meet specification requirements are, and remain, specific responsibilities of the Contractor.
- D. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary; and, should there be any charges in connection with this, they shall be borne by the Contractor.
- E. Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered and accessories as specified.
- F. Shop Drawings are not intended to cover detailed quantitative lists of valves, devices, fixtures, and similar items, as the Drawings and specifications illustrate those items; and it is the Contractor's responsibility to procure the proper quantities required to comply with the established requirements.
- G. Shop Drawings prepared to illustrate how equipment, piping, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified the conditions shown. Review by the Architect shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Shop Drawings.
- H. Various material submissions of such items as plumbing fixtures, drains, and other related items or accessories shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets. Cover sheets

for each item submitted shall have sufficient bare space to allow for shop drawing review stamps.

- I. Contractor shall process his submitted data to insure that it conforms to the requirements of the Drawings and specifications, and there are no omissions and/or duplications.
- J. Shop Drawings and Submittals shall be accompanied by certification from the Contractor, and firm preparing such, that Shop Drawings have been checked for, and are in compliance with, the Contract Documents.
- K. All Submittals and Shop Drawings shall have been submitted for review by the Architect and Engineer within 90 days after Contract Award Date.

1.10 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

- A. Seal voids around pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Section 07 84 00, Fire-Stopping.

1.11 DRAWINGS

- A. Drawings show diagrammatically the locations of the various pipes, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in full cooperation with work specified in other Divisions of these specifications; and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.
- B. Should any changes be deemed necessary in items shown on the Contract Drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.
- C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention prior to bids being submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate the installation of any particular apparatus.
- D. Lay out all work maintaining all lines, grades, and dimensions according to these Drawings with due consideration for the work of others. Verify all dimensions at the site prior to any fabrication or installation. Should any conflict develop or installation be found impractical, the Architect shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.
- E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of materials and work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.12 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

- A. Equipment supplied as portions of work specified under other Divisions of these specifications shall be furnished with proper roughing-in diagrams and shall be installed as a part of Division 22.
- B. Furnish materials and labor required for the connection of this equipment.

- C. Contractor shall ascertain that all equipment so specified is included as part of this work.

1.13 COOPERATION

- A. Coordinate all work indicated in Division 22 with work specified in other Divisions to assure proper and adequate interface with other portions of the work.
- B. Maintain contact and be familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed. Install the required systems in their several stages, at the proper time to expedite the work and avoid unnecessary delays in the progress of other portions of the work.
- C. Should any questions arise between work specified in Division 22 with respect to other portions of work specified in other Divisions of the Specifications, reference shall be made to the Architect for instructions.

1.14 MATERIALS AND EQUIPMENT

- A. All materials and equipment purchased shall be new. No used or reconditioned equipment will be allowed.
- B. **All material shall be manufactured in the United States and/or shall comply with the most current North America Free Trade Agreement, NAFTA/USMCA.**
- C. All materials, acceptable manufacturers, and installation methods shall comply with local AHJ, owner's technical design guidelines, codes, manufacturer's installation requirements, and ASTM requirements.
- D. Substitutions: Products of same functions, performance and design will only be considered if in full accordance with the requirements of Section 01 60 00, Product Requirements. The products of other manufacturers will be acceptable; only if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency, maintainability, and dependability, the purpose for which the items specified were intended.
- E. Listed Manufacturers:
 - 1. Manufacturers listed in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements, and are listed therein to establish a standard.
 - 2. The "listing" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
 - 3. Products offered by listed manufacturers shall be equal to, or superior in all respects to, that specified by named products; and shall meet or exceed specification requirements.
 - 4. The description of specific qualities takes precedence over the reference standards and the description of qualities and reference standards together take precedence over the named product of listed manufacturers.
- F. Product Options:
 - 1. Products specified only by Reference Standards or by Description only means that any product meeting those standards or descriptions, by any manufacturer, will be considered.
 - 2. Products specified by naming several products or manufacturers means that only the manufacturers named will be considered.
 - 3. Products specified by naming only one product and manufacturer means that no option exists unless a substitution is accepted. Submit a request for substitution for any product or manufacturer not specifically named.

4. Products specified by Description, Reference Standard, and naming several products or manufacturers means that any product and manufacturer named meeting those descriptions and standards will be considered. Submit a request for substitution for any product or manufacturer not specifically named.

G. Limitations or Substitutions:

1. During Bidding Period, Instructions to Bidders, in Division 1, will govern times for submitting requests for substitutions under requirements specified in this Section.
2. No later than ten (10) days prior to the bid date, Contractor shall notify the Architect in writing of any desired substitutions of products in place of those specified. These requests will be considered; and, if a favorable response is determined, this will be documented in the form of an Addenda.
3. Substitutions will not be considered when indicated or implied on Shop Drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
4. Substitute products shall not be ordered or installed without written acceptance.
5. Only one request for substitution for each product will be considered. If substitution is not accepted, Contractor shall provide specified product.
6. Architect will determine acceptability of any and all substitutions.

H. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior, as the Architect is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturer's engineering data, specification sheet, and a sample, if practical or if requested or specified. In no event shall a proposal for substitution be cause for delay of work. This shall include a detailed comparison to each product specification paragraph.

I. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

J. No substitutions will be considered contingent upon pending certification and rating agency approvals. Such certifications and ratings shall be in effect at the time of bidding.

1.15 EQUIPMENT SIZES AND REQUIREMENTS

A. Space allocations in machinery and mechanical equipment spaces are based on equipment scheduled in each case. Should the Contractor request a substitution for equipment of another make that requires more space in any critical dimension, the Contractor shall submit, together with other submittal data on the equipment, prints of drawings indicating how the equipment may be installed, indicating room for servicing and revisions in piping or ducting and any other details necessary for the Architect to form a judgement as to the suitability of the substitute material, as to performance, suitability for the space and other variables.

B. Duties of certain equipment items, horsepowers of driving motors and electrical characteristics are scheduled for equipment items of a particular make in each case. Should requests for a substitute material be accepted which has other requirements that would involve allied equipment or other portions of work, the Contractor shall be responsible for all modifications required at no change in contract price. As examples:

1. If an accepted pump motor has a brake horsepower requirement above the motor horsepower scheduled, the Contractor shall be responsible for providing

- a larger motor and heavier drive and any change in size of the protective device, conduit run and conductors serving that motor. The latter shall be extended through an individual branch protective device and branch circuit on through the panel, feeder, feeder protective device, etc.
2. If accepted, water heaters having a different power voltage, phase or breaker size than those on which the heater were based, the Contractor shall be responsible for adjusting electrical service work accordingly.
- C. Structural steel members are indicated to provide supports for certain specific sizes and weights of equipment. Should a substitution request involve other equipment, the spacing of the supports shall be varied to suite the equipment. Should the weight or size of a proposed substituted item of equipment require additional supporting steel members, the Contractor shall include documentation of the additional supports in the request for substitution and install them at no change in contract price if the substitution is accepted.
- D. Various large apparatus to be installed may require that the apparatus be installed prior to the installation of portions of structural, walls, or door frames. Coordinate the installation of these items to insure that no demolition of general construction is necessary for equipment installation or that the apparatus does not have to be disassembled for installation.

1.16 STORAGE AND PROTECTION OF MATERIALS

- A. Store and protect materials and equipment as specified in Section 01 60 00, Product Requirements.
- B. Contractor shall provide storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, and as directed by the Architect. In no case, shall storage interfere with traffic conditions in any public or project thoroughfare.
- C. All work and material shall be protected at all times. Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all mechanical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.
- D. On site storage shall not be inside the building during construction progress, but shall be in approved trailers or as specifically approved otherwise by the Architect. Storage inside the building shall only be allowed when so allowed by the Architect.

1.17 FOUNDATIONS

- A. Provide equipment foundations associated with the work specified in Division 22.
- B. All top corners and edges of all foundations shall be neatly chamfered at a one inch (1") high 45 degree angle.
- C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") below the equipment bases for alignment, leveling, and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary.
- D. After removal of the forms, the surface of the foundation shall be rubbed until smooth.
- E. Unless otherwise noted, foundations shall be four inches (4") thick for plumbing equipment, unless specifically noted otherwise on the Drawings.

- F. All concrete work shall conform to the requirements of Division 03, Cast-in-Place Concrete.
- G. Provide housekeeping pads and foundations for every item of floor mounted equipment specified in Division 22 specifications. Pads shall extend a minimum of two inches (2") in each direction beyond the equipment size.

1.18 EXCAVATION AND BACKFILLING

- A. Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground piping shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the piping and refilled to grade as specified. Installation shall comply with ASTM D2321. After the piping has been installed and reviewed by Architect and local building authorities, trenches shall be backfilled to grade with approved non-expansive materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by Architect shall be a part of this contract.
- B. Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet (5') in depth, Contractor shall pay a qualified engineer to prepare detailed Drawings and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project contract Documents.

1.19 WIRING

- A. Unless otherwise noted, all wiring for motors, starters, and equipment is specified in Division 26.
- B. Wiring of temperature controls shall be performed in accordance with the requirements of Division 26 but shall be performed as outlined in other sections of these specifications.
- C. All power for control circuits required for the Temperature Control System shall be provided and installed where indicated on the Division 26 Drawings, but shall otherwise be provided as indicated in other sections of these specifications.
- D. Each supplier of equipment requiring control shall have wiring diagrams furnished with submittals. This shall be used to determine conduit layouts required to complete the electrical portions of the instrumentation and control systems.
- E. All motors furnished as a portion of work specified in Division 22 shall be wired as specified in Division 26.
- F. Except where combination starter-disconnects are specified elsewhere herein or in Division 26, all motors shall be provided with safety disconnect switches in accordance with the National Electrical Code as specified in Division 26.
- G. Furnish all necessary wiring diagrams for equipment specified in Division 22, as a part of equipment submittals, for installation under other sections of these specifications.

1.20 EQUIPMENT STANDARDS

- A. All basic materials and equipment shall be standard catalog products of a reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year.
- B. First of a kind new technology devices will not be considered.
- C. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic materials or equipment shall carry the guarantee of the basic material or equipment manufacturer and repair and replacement parts shall be available through normal trade channels locally.

1.21 CLEAN UP

- A. Contractor shall be responsible for cleaning up after and during all work performed under this Division of the Specifications.
- B. Contractor shall, on a daily basis, remove construction trash and debris accumulation to minimize the entrance of dust, dirt, and debris in piping, ductwork, and mechanical equipment.
- C. At the completion of construction, just prior to Substantial Completion and sustained operation of equipment, thoroughly clean the inside of piping, ductwork, and equipment.
- D. Refer to Division 1.

1.22 FINAL CONSTRUCTION REVIEW

- A. Schedule: Upon completion of the work specified in Division 22, there shall be a final construction review of the completed plumbing systems installations. Prior to this walk-thru, all work specified in this Division shall have been completed, tested, adjusted, and balanced in its final operating condition and the preliminary test report shall have been submitted to and approved by the Architect.
- B. Personnel: A qualified person representing the Contractor must be present at this final construction review to demonstrate the system and prove the performance of the equipment.
- C. Building plumbing systems shall have been in operation for a minimum of 15 days and Test and Balance work shall be substantially complete prior to this review.
- D. Exceptions to the aforementioned requirements will be considered on a case-by-case basis dependent on the size and type of project, as well as construction schedule limitations.

1.23 CERTIFICATIONS

- A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.
- B. Provide copies of all applicable approved notices and inspection certifications from the various inspections conducted by the Local Code Enforcement Authorities.

1.24 GUARANTEE

- A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance, Substantial Completion, or as defined by Extended Warranty Contracts. This includes all work required to remove and replace the defective item and to make all necessary adjustments

to restore the entire installation to its original specified operating condition and finish at the time of acceptance.

- B. The Contractor shall also guarantee that the performance of all equipment furnished and installed under this Division of the Specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Owner's Representative may direct to demonstrate that the equipment installed meets the specifications and is delivering the capacity specified or called for on the Drawings.
- C. If there is any indication that the equipment does not meet the specified quantities, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to employ recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

END OF SECTION

SECTION 22 0553

IDENTIFICATION FOR PLUMBING EQUIPMENT AND PIPING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 22 Sections as applicable. Refer to other Divisions for coordination of work with other portions of the work.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete system of Piping Identification as specified herein for each of the systems as described herein.
- B. Provide a complete system of valve identification by the use of tags as described herein.
- C. Provide a complete system of equipment identification tags as described herein.

1.3 QUALITY ASSURANCE

- A. The installation of all mechanical system identification devices shall be performed under this Section of the Specifications using materials which are the product of reputable manufacturers. The application of the materials shall be in strict accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.
- B. Manufactured Piping Identification markers, equipment name plates and valve tags shall be a product of Seton Name Plate Corporation, EMED Company, Inc., or Craftmark Identification to meet all ANSI Standards pertaining thereto.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions in accordance with Section 22 05 00.
- B. Shop Drawings:
 - 1. Submit a list of all piping systems to be identified, color of background to be used, legend or wording to be displayed for each system, and the intended location of all markers to be displayed.
 - 2. Submit a list of equipment to receive identification tags, cut sheets and proof copies of tags which indicate location of tag and wording to be engraved thereon.
 - 3. Submit a list of valves with location, indicate type of service, type of tag, tag number and proposed valve tag chart as specified herein.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Storage and protection of materials shall be in accordance with Section 22 05 00.

PART 2 PRODUCTS

2.1 PIPING IDENTIFICATION SYSTEM

- A. Furnish piping identification markers for all insulated and uninsulated piping systems in sizes and colors in accordance with ANSI Standard A13.1. Markers shall be as manufactured by Seton Name Plate Corporation similar to their vinyl plastic "Setmark" pipe markers with flow arrows. For systems with overall outside diameters under 6" use the snap-around markers. For systems with overall diameters 6" and over use strap-around markers attached with nylon ties.
- B. Markers shall be provided as a minimum for the following systems:
 - 1. Domestic Cold Water (Green background)
 - 2. Domestic Hot Water (Yellow background)
 - 3. Drains (Green background), for all insulated drains not contained in one space or roof; i.e., an A/C condensate drain in a fan room shall not require identification, whereas, as drain extending to another space would.
 - 4. Sanitary Sewer (Green background)
 - 5. Sprinkler Piping (Red background)
 - 6. Non-Potable Water (Blue background)

2.2 EQUIPMENT IDENTIFICATION

- A. This Contractor shall provide identification plates similar and equal to Seton Name Plates, Style 2060.
- B. Name plates shall be a minimum of 1/16" thick and 1" X 3" in size with beveled edges. The surface shall be a black satin with a white core for lettering. Each plate shall be drilled with two mounting holes sized for 3/8" No. 3 round head nickel plated steel screws. Lettering shall be a minimum of 3/16" high. Lettering shall be cut through the black surface to the white core. Only name plates equal to those specified will be considered. No punched plastic tape or engraved aluminum plates are acceptable. Stick-on only plates are not acceptable.
- C. Provide and install identification plates on the cover of all starters or disconnects or combination starter-disconnects, where not mounted directly on the equipment, delivered by the mechanical system installer to the electrical systems installer and on each piece of Mechanical Equipment to include but not necessarily limited to:
 - 1. Pumps.
 - 2. Water Heaters.
 - 3. Expansion Tanks
 - 4. Thermostatic Mixing Valves.
- D. Name plates shall have complete words describing equipment type, use and service. As an example, air handlers shall be designated "AHU-S-X MEP Shop" to designate the equipment as an air handler, number of air handler and area served. Use multiple or larger name plates as required to fulfill this requirement.

2.3 VALVE TAGS

- A. Wire onto the handle of each valve installed a 19 gauge brass disc not under one and one-half inches (1-1/2") in diameter stamped with 1/4" high black paint filled letters over 1/2" high black paint filled numbers. Use "PLBG" as letters for Plumbing Valves, "AC" or "HVAC" for Air Conditioning System Water Valves or "FP" for Fire Protection Valves, followed by an identifying number. Tags shall be equivalent to Seton Style 250-BL.
- B. Secure valve tags to valves by use of brass "S" hooks or brass jack chains.

- C. The number, location, and purpose corresponding to each valve shall be listed in sequence, properly typewritten on a schedule sheet to be turned over to the Owner.
- D. Provide two (2) framed valve tag charts with typed schedule sheets contained therein. Charts shall have an aluminum frame with clear plastic or lexan window.

2.4 BURIED UTILITY WARNING AND IDENTIFICATION TAPE

- A. Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping or utilities. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 3 inches minimum in width, color coded for the utility involved with suitable warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Provide for underground natural gas piping systems.
- B. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Bury tape with the printed side up at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

PART 3 EXECUTION

3.1 PIPE MARKER INSTALLATION

- A. Provide flow arrows at each marker location.
- B. Markers shall be spaced not more than 15 feet on center and at each change of direction but not more than 4 feet in each direction from each elbow and tee. Markers not required on piping runouts less than four feet (4') in length and 1-1/4" or smaller in size.
- C. Identification markers shall be installed on all new piping; indoors, outdoors and in the crawl space except for drain and waste lines 3/4" and smaller.
- D. Install markers on exposed piping systems only after jacketing systems and finish paint coats are complete. Refer to Sections 09 90 00 and 22 07 00.

3.2 IDENTIFICATION TAG INSTALLATION

- A. Secure tags level and in a conspicuous location with adhesive on equipment starters or combination starter disconnects and on the equipment where starters are not immediately adjacent to the equipment served.
- B. Additionally, secure all tags with screw fasteners after secured with adhesive.

3.3 VALVE TAGS

- A. Secure Valve tags to each valve with Brass "S" hooks or jack chains on each valve stem corresponding to the valve tag chart list.
- B. Secure Valve Tag Chart List to Central Mechanical Room wall near the main entry at 60" above finished floor or where otherwise directed by the Architect. Provide second chart to Owner for their disposition.

END OF SECTION

SECTION 22 0700

PLUMBING INSULATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 22 Sections as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

- A. Provide the systems of insulation which are specified for the control of heat transfer, sound control, and prevention of condensation.
- B. Provide protective devices to prevent compression abrasion or puncture of the piping insulation systems installed to include inserts, pipe shields, PVC jacketing and aluminum jacketing as specified herein.
- C. Provide piping identification systems as specified in Section 22 05 53, Identification for Plumbing Piping and Equipment.
- D. Provide heat tracing as specified in Section 22 05 33, Heat Tracing for Piping.

1.3 QUALITY ASSURANCE

- A. The installation of all thermal insulation shall be performed by a single firm regularly engaged in the insulation business, using skilled insulation mechanics and using insulation materials which are the product of reputable manufacturers. The application of the materials by the insulator shall be in accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.
- B. Materials shall be manufactured by Schuller, Pittsburg Plate Glass, Owens-Corning, Foster, Certainteed, Mansville, or Knauf.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions to allow review of Materials and Methods to ensure complete compliance with specifications in accordance with Section 22 05 00.
- B. Shop Drawings: Submit materials to be used and method of application for each system in tabular form. General statements not specifically identifying means or methods to be used shall be cause for rejection. Include descriptive data and cut sheets on each type of insulation material, sealing method, adhesives used, insert types, shield sizes, and PVC or aluminum jacketing as specified.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Promptly replace all damaged, deteriorated or wet insulation materials.
- C. Storage and protection of materials shall be in accordance with Section 22 05 00.

PART 2 PRODUCTS

2.1 PIPING AND EQUIPMENT INSULATION MATERIALS

A. Domestic Cold and Hot Water Supply, Return, and Non-Potable Water Piping Insulation:

1. Insulation shall be approximately 4 lb. or heavier in density, molded sectional glass fiber pipe covering with factory applied, white FRG, fire resistant, vapor barrier jacket.
2. Insulate valves and fittings with pre-molded glass fiber fitting covers equal in thickness to the adjoining pipe covering. In lieu of pre-molded fitting covers, for welded pipe fittings only, insulate with field fabricated mitered segments of pipe covering equal in density and thickness to the adjoining pipe covering. Use loose low density glass fiber insulation compressed tightly and equal to thickness of adjoining straight pipe sections for screwed fittings; vapor sealed with one 1/8" thick wet coat of water based Foster 30-33, Childers CP-33 vapor barrier coating, or approved equivalent. Vapor barriers- coatings shall have a maximum permeance rating of 0.07 at 43 mils dry film thickness per ASTM E-96, or equivalent adhesive, and imbedded in a glass fabric tape which has an emulsion imbedded in it and a coating on it; apply a second 1/8" thick coat of Foster No. 30-33, Childers CP-33 vapor barrier coating, or equivalent adhesive and apply a PVC jacketing as specified elsewhere herein.
3. Finish entire installation with PVC sheet jacketing where exposed from the finished floor up to 12'-0" above the finished floor including all portions of horizontal piping that occurs at and extends above 12'-0". Jacketing shall be applied to all straight piping sections, as well as all elbows, tees, valves, and fittings. Use "smoke-safe" PVC fitting covers, similar to Speedline 1, Knauf "Proto" or John Manville "Zeston 2000". Suitably seal all jacketing seams with tape, or other approved means, along the entire length of seams.
4. Loose "Diaper" inserts at fittings shall not be allowed.
5. Insulation thickness shall be as follows:

PIPING SYSTEMS	INSULATION THICKNESS - INCHES PIPE SIZES				
	RUNOUTS 3/4" & SMALLER	LESS THAN 1"	1" TO 1- 1/4"	1-1/2" TO 3"	4" & OVER
Domestic Cold Water	1.00	1.00	1.00	1.00	1.00
Domestic Hot Water, Hot Water Return Water	1.00	1.00	1.00	1.50	1.50
Non-Potable Water	1.00	1.00	1.00	1.00	1.00

B. Waste, Drain and Miscellaneous Lines:

1. Insulate the body of each floor and roof drain, where the body of the drain is out of the ground, or above a ceiling, with One-Coat of Insulating Cement, or equivalent, to a 1" thickness and coat with two 1/8" thick coats of Foster No. 30-80, Childers CP-33 vapor barrier coating, or equivalent adhesive, reinforced with an intermediate glass fabric tape saturated with lagging adhesive.
2. Waste lines for E.W.C.'s, floor drains receiving condensate from air handling equipment condensate pans to the point where they join the vertical stack or sanitary main, all horizontal and vertical primary storm drainage piping to the

point of penetration to the underfloor and the first vertical piece of the overflow drain pipe (below the drain body) and the first horizontal section of overflow drain piping to the first three feet (3') of vertical pipe beyond that section: Insulate as described for domestic water lines, except the insulation shall be minimum 1/2" thick (use 1" thick where 1/2" thick is unavailable in the pipe sizes needed). Complete vapor seal shall be required.

- C. Expansion Tanks and Domestic Hot Water Storage Tanks: Insulate with 2" thick, approximately 4 lb. density fiberglass, pipe or board insulation, rigid, or rigid-scored- for-curvature; carefully cut and/or mitered to fit contours and point up voids and dents with insulating cement. Protect ASME labels from physical damage and being covered with mastic and insulation. Completely expose ASME labels and bevel insulation around such labels and seal exposed cut insulation with mastic. For domestic water system labels provide an "Armaflex" Patch, removable, 1/2" thick. Finish with PVC sheet jacketing similar to piping systems.
- D. Plenum Safe Jacketing:
1. Where non-plenum rated piping (such as PVC, FRPP, PE, PP, etc.) is installed in return air plenums cover all exposed portions of this piping with a plenum safe jacketing, or wrap, system that is a factory manufactured and tested non-combustible barrier, to flame and smoke spread, designed to encapsulate non-rated or combustible items located in return air plenums, in accordance with the most recent additions of the International Building and Plumbing Codes.
 2. Plenum safe jacketing shall be covered with a light weight fiberglass reinforced foil scrim finished high temperature rated insulation with an approximate density of 6 pounds per cubic foot. Jacketing shall have a Flame Spread and Smoke Developed rating of 0 for the unfaced blanket and be under 25 and 50 respectively for these items as tested in accordance with U.L. 723 and ASTM E-84. Maximum Flame Spread in accordance with U.L.1887 shall be 0 feet. Maximum smoke/optical density and Average Smoke per U.L.1887 testing shall not exceed 01 and 0 respectively. U.L. 1887 test procedure is a modified tunnel test which provides test data for flame spread and smoke density using a single plastic pipe and a bundle of plastic pipes of various sizes subjected to a fire test.
 3. Thermal resistance of the barrier system shall be 4.2 as tested in accordance with ASTM C518. The Barrier System shall be able to withstand an operating temperature up to 2,300 Deg.F. and have a melting point of no lower than 3,100 Deg.F.
 4. Plenum safe jacketing shall be a minimum 1/2 inch thick and have at least one side covered with a foil skin which must face the outer, or exposed, side. All joints in each direction shall be overlapped a minimum of one inch (1"). Jacket shall be secured tightly around the piping with either stainless steel banding or stainless steel tie wire. Use stainless steel crimp clamps on banding fasteners. Tie wires shall be secured using twist tensioning. Seal all cut edges with aluminum foil tape to ensure there is no exposed fiber.
 5. Plenum safe jacketing shall be as manufactured by:
 - a. Great Lakes Textiles, Inc. or approved equals by;
 - b. 3M Corporation.
 - c. Thermal Ceramics.
 - d. FryeWrap by Unifrax.
- E. Water Filled Drain, Domestic Water and any other Water Filled Lines Exposed to the Outdoors:

1. Protect to -10 degrees F. By wrapping with heat trace wire with thermostata strapped to lines.
2. Then insulate with 1" thick, 4 lb. Or heavier density molded glass fiber jacket covering with FRJ jacket. Insulate fittings same as described earlier herein for chilled and heating water piping.
3. Finally cover with an 0.016" thick aluminum with locked seams and banded joints made watertight. Jacketing shall be equivalent to Childers Aluminum roll jacketing confirming to ASTM B-209, with smooth mil finish.
4. Cover valves, mechanical couplings, and fittings with prefabricated aluminum jacketed fitting covers with factory applied moisture barriers to thickness to match that on piping and band in place. Fitting covers shall be equivalent to Childers ELL-JACS, Tee-Jacs, Flange-JACS, and Valve-JACS. Seal ends to prevent moisture penetration and to make completely weatherproof.

PART 3 EXECUTION

3.1 GENERAL

- A. Apply insulation and pipe covering after all of the piping system to be insulated has been pressure tested, found to be completely tight (without leaks), and accepted as such. All insulated T-handles, blow-down valves, extended handles and caps should be installed prior to commencing with insulation. Verify that control, isolation, and balancing valves and any other piping specialty where a valve stem or test port extends beyond the normal pipe insulation thickness to be installed is installed pointed upward vertically. Thoroughly clean and dry all surfaces prior to being covered.
- B. For operational systems, perform work after operational hours and only during periods of scheduled equipment shutdown. During this period water flow to the piping segments to be insulated shall be stopped and the water and piping shall have equalized in temperature with the average ambient temperature of the space in which the piping is installed. If time does not permit this to occur then apply heat to the piping in a controlled, suitable manner, to warm the water and pipe sufficient to prevent any condensation from occurring during the insulation process. For any segments to be left uninsulated until the next system shutdown, mastic seal the ends and penetrations through of the installed insulation and allow sealant to dry prior to re-energizing the water system. Continue to insulate the piping system in small enough portions after-hours, or as required, to insure no insulation is applied over a wet surface.
- C. In the covering of surfaces subject to low temperatures (below 60 Deg. F.), take extreme precautions to secure a complete vapor seal and avoid air pockets of any kind within the insulation. All insulation shall be tightly fitted to the piping system and all systems shall have an equal thickness and density of insulation around all piping, valves, strainers, accessories, etc. Where fiberglass insulation is cut to contour insulation around valves or strainers add additional insulation to obtain the overall insulation thickness specified. Where vapor barrier jackets are lapped at seams and joints, paste such flaps carefully to assure no break in the vapor seal. Seal around butt joints with strips of vapor barrier jacket. Use self-sealing laps on all insulation for pipes carrying a medium below 60 Deg.F. Stapling will not be permitted where vapor barrier jackets are specified. Vapor barriers for these systems shall have a perm rating not to exceed 0.05.
- D. On glass fiber pipe covering with factory applied vapor barrier jacket, lap the jacket on the longitudinal seams and seal with vapor barrier lap adhesive equivalent to water based Foster 30-33, Childers CP-33 vapor barrier coating, or approved equivalent. Vapor barriers - coatings shall adhere to a maximum permeance rating of 0.07 at 43 mils dry film thickness per ASTM E-96. Tightly butt the ends and cover butt joints with a 4" wide band of vapor barrier jacket secured with the same adhesive. At all run-out piping to

water equipment mastic seal the ends of the branch piping insulation where it meets the main piping insulation to prevent the migration of moisture should it ever become trapped in the insulation system. Generally, mastic seal the ends of butt joints in water piping systems every 50 feet for the entire system.

- E. Where jacketing systems are specified, use standard weight, PVC sheet rolls. Exercise care to locate seams in an inconspicuous place and apply all jacketing neatly, including that on valves and fittings. Unsightly work will be considered a justifiable basis for rejection. Adhere the jacketing in all cases with a lagging adhesive, Foster 30-36 A F (Anti-Fungal) or Childers CP-137 AF, or other approved methods. Lagging adhesives shall meet ASTM D 5590 with a "0" growth rating.
- F. All insulation shall be continuous through wall and ceiling openings and sleeves.
- G. All insulation and accessories shall have composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723 not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50
- H. No insulation shall be applied to the bodies of unions and flanges on domestic hot water supply and circulating lines only. Terminate the insulation short of the unions or flanges at this equipment, and bevel off at a forty five degree angle to permit "breaking" the union or removal of the flange bolts without damaging the insulation. Bevel the insulation off also at caps on scale pockets, and blow-off connections on strainers, and at valve bonnets on these same systems.
- I. Unsightly work shall be cause for rejection, including poor application of adhesives and coatings beyond the insulation which coats valves or other piping specialties.
- J. Damage or Modification to Insulation: Where new insulation is disturbed or damaged during the process of installing other new materials, making new connections, etc., it shall be repaired or replaced to return it to its original condition and appearance. Where lines are removed and connections to insulated lines are capped, insulate those caps as well as repairing damaged insulation. Materials shall match those presently installed in thickness, density, insulating value, jacketing, etc.
- K. Miscellaneous Lines: Piping connected to water lines through which there might be fluid flow on occasions such as the lines connected to air vents, lines running to compression tanks, etc. shall be insulated as described for other piping in those systems.
- L. Hanger and Support Locations: At the location of hangers or supports for pipes run above ground and finished with a vapor seal insulation, provide rigid sections of cork, Foamglas, calcium silicate or high density polyurethane, at least the same thickness as the adjacent insulating material to adequately support the pipe without compression of the insulating material and cover with a vapor seal that is bonded to the adjacent insulation as described for fittings in the lines. Where the insert has an insulating value less than the adjacent pipe insulation the thickness of the insert shall be increased to equal the insulating value of the adjacent pipe insulation. Wood inserts shall not be allowed. Hangers and supports for piping insulation to receive a vapor barrier shall be installed exterior to the insulation.
- M. Material Changes: Wherever there is a change in materials on lines that are vapor sealed, apply a suitable adhesive that is compatible with both materials, tapes, etc., as required to maintain the vapor barrier.

- N. The following describes materials, thickness and finishes for insulation on piping. In the following "exposed" shall mean any pipe exposed below the finished ceiling and structure where no ceiling is installed, in any room space, area, mechanical rooms, closets, and any pump run exterior to the building, including above the roof. "Concealed" shall mean any pipe located above ceilings, in furrings, in chases, in crawl spaces, and buried in direct contact with the soil.
- O. In all "exposed" areas, up to 12'-0" above the finished floor, insulation shall receive a PVC jacketing system. Neatly install all jacketing for finish painting.
- P. All insulation materials and jacketing shall exhibit the following characteristics:
1. Water sorption, per ASTM C 1104, shall be less than 0.02%.
 2. Linear shrinkage, per ASTM C 356, shall be negligible.
 3. Stress corrosion, per ASTM C 795, shall not cause corrosion.
 4. Corrosiveness, per ASTM C 665, shall not be any greater than sterile cotton.
 5. Resistance to fungi, mold and mildew and bacteria, per ASTM C 665, shall be rated as not promoting growth of fungi and bacteria. Inhibitors shall be added to specified products to meet these requirements.

3.2 SHIELDS AND INSERTS

- A. Metal saddles, shields, shall be applied between hangers or supports and the pipe insulation. Saddles shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for hanger inserts. Shields shall be made of galvanized sheet metal and shall be of sufficient size and length to prohibit the crushing of the insulation materials. Saddle shields shall be as follows:

Pipe Size	Metal Saddles	
	Metal Gauge	Length
3/4" to 3"	18	12"
4" to 6"	16	12" - 18"
8" to 10"	14	24"
12" & Larger	12	24"

- B. Provide inserts of calcium silicate on hot piping and cellular glass or 7#/Cu.Ft. fiber glass pipe insulation on cold piping at hangers except pipes 1-1/2" or smaller in size. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of a thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than the following lengths:

Pipe Size	Insert Length
3/4" to 3"	12"
4" to 6"	12" - 18"
8" to 10"	24"
12" & Larger	24"

END OF SECTION

SECTION 22 1116

DOMESTIC WATER PIPING SYSTEM

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 01 - General Requirements and referenced documents.
- B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete system of domestic hot and cold water supply as indicated herein and as illustrated on the contract drawings.
- B. Provide isolation of systems through valving as shown or indicated herein.
- C. Provide a system free of water hammer.
- D. Isolate all piping components to eliminate all audible vibration and noise.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 01.
- B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.
- C. Product Data:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining methods.
 - 4. Shock arrestors.
 - 5. Hose bibbs.
 - 6. Hydrants.
 - 7. Backflow preventers.
- D. Certification: Submit certification that completed system complies with sterilization procedures and test requirements of municipality, State, and other public authorities having jurisdiction over system sterilization.
- E. Submit copies of pressure test data of water systems to Owner prior to time of final completion of construction work.
- F. Provide closeout documents as required in Division 1, Section 01 17 00.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in following order of precedence:
 - 1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing.
 - 2. Provisions specified in this Section.
 - 3. International Plumbing Code.
- B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Above ground:

1. 2 Inch and Smaller:
 - a. Pipe: Hard drawn copper water tube, ASTM B88, Type "L".
 - b. Fittings:
 - 1) 2 Inch and smaller, wrought copper solder joint fittings, ANSI B16.22.
 - c. Joint solder:
 - 1) 95% tin - 5% antimony for pipe sizes 2" and less.
 - 2) Or 95.5% tin, 4% copper and 0.5% silver based for pipe sizes 2" and less.
 - 3) No lead containing solder is allowed.
 - d. Fitting (Alternative - ProPress)
 - 1) 2" and smaller, wrought copper. Press fittings, or ASME 16.2.2, ASME 16.18 sealing with EPDM sealing element for ½" to 2".

B. Underground 5'-0" beyond exterior of building:

1. 3 Inch and Smaller:
 - a. Piping: Hard drawn or annealed copper tube, ASTM B88, Type K.
 - b. Fittings: Wrought copper solder joint fittings, ANSI B16.22
 - c. Joint solder: "Silfos" only, no lead containing solder allowed.

C. Underground piping within 5'-0" exterior of building:

1. 2 Inch and Below:
 - a. Pipe: Annealed copper coils, ASTM B88, Type K.
 - b. Fittings: No fittings allowed below slab.

D. Optional piping when approved by Local Authorities having jurisdiction. Underground 5'-0" beyond exterior of building:

1. 2 Inch and Smaller:
 - a. Piping: Polyvinyl Chloride (PVC) pipe; ASTM D1784 and ASTM D1785 or ASTM 2241. NSF stamped and approved for potable water system and rated for 200 psi minimum pressure.
 - b. Fittings: Schedule 40 PVC ASTM D2466 NFS stamped and approved for potable water system. Fittings shall be rated for 250 psi working pressure.

E. Unions:

1. 2 Inch and Smaller: ANSI B16.22 wrought copper; solder end fittings.

F. Valves and Supports: Provide lead-free bronze full-port ball valves with stainless steel trim for pipe sizes 2" and smaller. Butterfly valve are not allowed. Refer to Section 22 05 00 and 22 21 13, Basic Materials and Methods

2.2 SPECIALTIES

A. Access Doors:

1. Milcor "Style K, M, or DW", stainless steel to suit surface application.
 2. Panels to have cam locks and door sized 18 inches by 18 inches
 3. All restroom/toilets and kitchen areas shall have stainless steel access doors.
- B. Shock Arrestors:
1. Acceptable manufacturer: Sioux Chief Manufacturing Co., Precision Plumbing Products (PPP), Josam, Jay R. Smith.
 2. One piece, seamless copper construction.
 3. Piston type, triple "O" ring copper construction.
 4. Factory charged.
 5. Plumbing Drainage Institute (PDI) certified.
 6. ASSE 1010 approved with lifetime warranty, not requiring access.
 7. Size as shown on drawings or as recommended by manufacturer.
 8. Acceptable product: "Hydra-Rester", Sioux Chief Manufacturing Co.
- C. Air Chambers: Same material and size as pipe branch or riser; minimum of 18" long.
- D. Vacuum Breakers:
1. Acceptable manufacturer:
 - a. Watts.
 - b. Febco.
 - c. Apollo.
 2. Atmospheric, check valve type.
 3. Bronze body construction with polished chrome finish.
- E. Reduced Pressure Type Backflow Preventer Assembly:
1. Acceptable manufacturers:
 - a. Watts.
 - b. Apollo
 - c. Ames.
 2. Double check valve type with shutoff valves.
 - a. Quarter turn ball shut-off valves up to 2-1/2 Inches.
 - b. Outside stem and yoke gate shut-off valves 3 Inches and over.
 3. Differential pressure type relief valve with air gap fitting.
 4. Lead-Free bronze body construction up to 2-1/2 Inches.
 5. Cast iron body construction 3 Inches and over.
 6. Provide in-line upstream y-type strainer.
 - a. 20 mesh strainer 2 Inches and below.
 - b. 0.125 perforated screen mesh 2-1/2 Inches and over.
 7. Acceptable Product: Watts No. 909S (FDA)-QT.
- F. Double Check Backflow Preventer Assembly:
1. Acceptable manufacturers:
 - a. Watts.
 - b. Apollo
 - c. Ames.
 2. Double check valve type with shutoff valves.
 - a. Quarter turn ball shut-off valves up to 2-1/2 Inches.
 - b. Outside stem and yoke gate shut-off valves 3 Inches and over.

3. Lead-Free bronze body construction up to 2-1/2 Inches.
 4. Cast iron body construction 3 Inches and over with stainless steel internal ports and FDA approved fused epoxy coating.
 5. Provide in-line upstream y-type strainer.
 - a. 20 mesh strainer 2 Inches and below.
 - b. 0.125 perforated screen mesh 2-1/2 Inches and over.
 6. Acceptable Product: Watts No. 709S (FDA)-QT.
- G. Hose Bibbs Within Mechanical Rooms or Unfinished Building Space: 3/4" chrome plated brass compressed cocks; hose connection; key handle, lock shield, vacuum breaker; Chicago No. 998 or No. 952, as required; or equivalent by T&S Brass or Woodford.
- H. Wall Hydrants - Exposed Non-Freeze Wall Hydrant with Integral Vacuum Breaker: Josam #71000-74-95 cast bronze hydrant with satin nickel alloy scoriated with cylinder vandalproof lock face, integral backflow preventer. "T" handle key, and bronze casing with 3/4" universal inlet connection.

2.3 DOMESTIC WATER CONDITIONING SYSTEM

- A. The Contractor shall provide an electromagnetic pulse generator on each domestic water main and on each domestic hot water return line, just prior to reconnecting to the water heater. This pulse generator shall hold molecularly change the "scaling" properties of the calcium and magnesium carbonates located in the water supply. The main supply shall be provided with an EasyWater "No-Salt Conditioner" EF-50-IN and the domestic hot water return piping shall be provided with an EasyWater "No-Salt Conditioner" CS400.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations.
- B. All piping shall be properly cleaned and reamed to the full inside diameter of the pipe size prior to joining.
- C. Connections to Equipment:
1. Install necessary pipe connections and fittings required to connect equipment.
 2. No rough-in shall be done before drawings of equipment are received.
 3. Make all final connections to include unions or flanges to facilitate future removal.
 4. Install cutoff valves on equipment connections.
- D. Install shock arrestor ahead of each quick closing valve, at top of each riser and on pipe run to water closets as recommended by manufacturer. Shock arrestors shall be accessible as required by Local Codes.
- E. Install backflow preventers at connections to closed mechanical water system makeup such as chilled water and hot water systems and beverage dispenser connections as required by Local Codes.
- F. Pressure reducing valve assembly shall be installed as required when city water supply pressure exceeds 80 psig at the building domestic water header.
- G. Coordinate routing of domestic water piping routing locations in large volume spaces with architects plans, including elevations. Routing of piping to be concealed where possible. Architect to review routing of piping in these spaces during shop drawing review.
- H. Strictly coordinate locations of wall clean out cover plates and access doors. Submit locations to the Architect prior to installation for final approval.

3.2 FIELD QUALITY CONTROL

A. Testing:

1. Furnish instruments, equipment, and labor necessary to conduct tests.
2. Methods of sampling, inspecting, and testing shall conform to local codes.
3. Tests of plumbing systems:
 - a. Plumbing piping systems shall be pressure tested.
 - b. Underground piping shall be tested and successfully repaired prior to backfilling.
4. Water Systems:
 - a. When rough-in is completed and before fixtures are set, entire hot and cold water and piping systems shall be tested at hydrostatic pressure of not less than 100 psig, and approved tight at this pressure for not less than 30 minutes.
 - b. Where portion of water piping system is to be concealed before completion, portion shall be tested separately as specified for entire system.
5. Domestic hot water circulating system: Balance and check prior to final inspection and provided with sufficient thermometers installed at time of final construction review to prove that water is circulating in all piping loops to fixtures.
6. Defective work:
 - a. If inspection or test shows defects, defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated.
 - b. Repairs to piping shall be made with new materials.
 - c. No caulking of screwed joints or holes will be acceptable.

B. Disinfection:

1. After pressure tests have been made and leaks repaired, flush entire domestic water distribution system with water until entrained dirt and mud have been removed.
2. On the building side of each water meter assembly, provide a minimum 3/4 inch connection for injection of sterilizing fluid to disinfect the piping system chlorinating materials utilizing liquid chlorine or calcium hypochlorite shall be used.
3. Provide dosage of not less than 50 parts per million.
4. Retain treated water in pipe long enough to destroy all non-spore forming bacteria.
5. Retention time shall be at least 24 hrs. and shall produce not less than 10 ppm of chlorine at extreme end of system at end of retention period.
6. Open and close valves in system being disinfected several times during contact period.
7. Flush system with clean water until residual chlorine is reduced to less than 1.0 ppm versus 0.2 at the most remote fixture.
8. During flushing period, open and close valves and faucets several times at several locations.
9. From several points in system, take samples of water in properly disinfected containers for bacterial examination.
10. Repeat disinfecting until satisfactory bacteriological results have been obtained and City Health Dept. has made final approval of test.

3.3 ADJUSTING AND CLEANING

- A. Equipment, pipes, and valves shall be cleaned of grease, metal cuttings, and sludge that may have accumulated from operation of system during test.
- B. Stoppage, discoloration, or other damage to finish, furnishing, or parts of building, due to failure to properly clean piping system, shall be repaired.
- C. When work is complete, adjust hot water systems for uniform circulation.
- D. Adjust flush valves and automatic control devices for proper operation

END OF SECTION

SECTION 22 1316

SANITARY WASTE AND VENT SYSTEM

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 01 - General Requirements and referenced documents.
- B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete sanitary waste and vent system as indicated herein and as illustrated on the contract drawings.
- B. Provide trap primer connections on floor drains or other devices as indicated and as required by the local authorities having jurisdiction.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00.
- B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.
- C. Product Data:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining methods.
 - 4. Floor drains.
 - 5. Clean outs.
- D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction over system.
- E. Provide closeout documents as required in Division 1, Section 01 70 00.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in following order of precedence:
 - 1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
 - 2. Provisions specified in this Section.
 - 3. International Plumbing Code.
- B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. Above and Below ground:
 - 1. Schedule 40 PVC Piping for waste water discharge or 140 deg. F or less:

- a. Pipe 1-1/2 - 6 inches: Poly Vinyl Chloride (PVC) schedule 40, drain waste vent (DWV) pipe, ASTM D2466, ASTM D 2321, ASTM D2665 and ASTM 1785, NSF stamped and approved. System shall be rated for 200 psi minimum pressure.
 - b. Fittings 1-1/2 - 6 inches: Poly Vinyl Chloride (PVC) schedule 40, DWV patterned fittings, ASTM D2466 and ASTM 1784, NSF stamped and approved.
 - c. Solvent Cement: Shall comply with pipe and fitting manufacturer's recommendations and shall be a two (2) step process with Primer manufactured for thermoplastic piping systems and solvent cement per manufacturer and shall conform to ASTM D2564 and ASTM F656.
- B. Below Slab or Grade for waste water discharge of 140 Deg. F or greater and within 5 feet of perimeter grade beams:
 - 1. Pipe, all sizes: ASTM A74, service weight, cast iron, single hub.
 - 2. Fittings, all sizes: ASTM A74, service weight, cast iron, hub and spigot fittings.
 - 3. All cast iron soil pipe and fittings shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI) and be NSF Internationally listed.

CLEANOUTS

- C. Acceptable Manufacturers:
 - 1. Model numbers specified are products of Jay R. Smith, unless otherwise specified.
 - 2. Other acceptable manufacturers:
 - a. Josam.
 - b. Wade.
 - c. Zurn.
 - d. Watts.
- D. Size: Same size as pipe up to 4 Inches; 4 Inch for 4 Inch and larger pipe.
- E. Cleanouts for Cast Iron Pipe: Tapped extra heavy cast iron ferrule, caulked into cast iron fittings.
- F. Wall cleanouts shall be provided at each fixture and/or group toilets as follows
 - 1. Sinks – Wall cleanouts set flush to wall or back panel of casework.
 - 2. Lavatories – Wall cleanouts set flush to wall.
 - 3. Urinals – Wall cleanouts set flush to wall set 2" above the flood rim of the urinal.
 - 4. Water Closets – Wall cleanouts set flush to wall, 12" above flood rim of the water closet.
 - 5. Contractor shall utilize a sweeping wye-fitting to install clean-outs off waste or vent piping at fixtures
- G. Cleanout Plugs:
 - 1. Meet requirements of Plumbing Code, with American Standard pipe threads.
 - 2. Taper thread bronze plug.
 - 3. Or neoprene gasket seal ABS plug.
- H. Cleanouts do not require special covers on lines in completely accessible pipe chases or in equipment rooms where piping is exposed.
- I. Pipe Fittings at Cleanouts: Make cleanouts turning out through walls and up through floor by long sweep ells or "Y" and 1/8 bends.
- J. Cleanout Cover Plates:

1. Provide face or deck plates for concealed cleanouts to conform to architectural finish in room.
2. Where no definite finish is indicated, wall plates shall be stainless steel and floor plates Nickel Bronze.
3. Provide vandalproof screws.

K. Acceptable Products:

1. In floor with Linoleum tile or vinyl tile finish:
 - a. Round Nickel Bronze top.
 - b. Scoriated top.
 - c. Smith No. 4051L-NB-U.
2. In floor with ceramic tile finish:
 - a. Square Nickel Bronze top.
 - b. Scoriated top.
 - c. Smith No. 4051L-NB-U,
3. In finished rooms flush with wall:
 - a. Vandal Proof Stainless Steel Center screw.
 - b. Cleanout tee with Stainless Steel Round Cover.
 - c. Smith No. 4530Y-SS-U.
4. In fan or mechanical room floors with concrete finish and/or with floating floors:
 - a. Round Nickel Bronze Extra Heavy Duty top.
 - b. Secured Scoriated top.
 - c. Smith No. 4111L-NB-U.
5. In floors with carpet:
 - a. Continuous Carpet: Round Nickel Bronze top with Nickel Bronze Carpet Clamping Device (-X).
 - b. Carpet Squares: Round Nickel Bronze Scoriated top below carpet with screwed Stainless Steel Carpet Cleanout marker (-Y).
 - c. Smith No. 4031L-Y-NB-U or 4031L-X-NB-U.
6. For terrazzo floor finish:
 - a. Round Nickel Bronze top.
 - b. Scoriated top.
 - c. Smith No. 4051L-NB-U.
7. Exposed Stack:
 - a. Duco Coated Cast iron cleanout "tee".
 - b. Gasket Sealed countersunk bronze plug.
 - c. Smith No. 4511S-Y-U.
8. Underfloor Chase:
 - a. Cast Iron Cleanout body.
 - b. Gasket Sealed countersunk bronze plug.
 - c. Smith no. 4293L-U.
9. Vehicle Traffic Outside Grade:
 - a. Duco Coated Heavy Duty Cast Iron Round Cleanout Housing.
 - b. Soriated Cast iron Cover with Lifting Device.
 - c. Vandalproof screws.

- d. Cast iron cleanout ferrule and Gasket Seal Bronze Plug.
 - e. Smith No. 4262L-U.
10. Grade:
- a. Duco Coated Extra Heavy Duty Cast Iron Top.
 - b. Installed in concrete block 18" x 18" x 6", or surround each cleanout with a minimum of four inches (4") of concrete by six inches (6") thick, top of block shall be flush with finished grade.
 - c. Smith No. 4232L-U.

2.2 DRAINS

A. Acceptable Manufacturers:

- 1. Josam.
- 2. Jay R. Smith.
- 3. Wade.
- 4. Zurn.
- 5. Watts.

B. P-traps:

- 1. Provide floor and equipment drains with cast iron P-traps.
- 2. Provide deep seal traps where indicated, or as required.

C. Trap Guard: Provide where indicated on the drawings. Trap Guards shall comply with ASME A112.6. equal to ProSet System, Trap Guard.

D. Clamping Collars: When installed with waterproofing membrane, or shower pans, provide floor drains with clamping collar.

E. Floor Drains/Sinks:

- 1. Floor Drain "FD-1" - For Finished Areas: Smith No. 2005-A06NB-U, cast iron body with cast iron collar, adjustable six inch (6") round secured satin finish bronze strainer, vandalproof screws, and bottom outlet. Provide Smith No. 3510-F1107NB cast iron body and cast iron collar, adjustable seven inch (7") round nickel bronze strainer, and four inch (4") round nickel funnel for drains that receive indirect waste piping from equipment or fixtures. Provide six inch (6") square top strainer size for Square Ceramic Tile Floors. Smith No. 2005-B06NB.
- 2. Floor Sink "FS-1": Smith No. 3150Y-13-C cast iron body flanged floor sink with acid resistant coated interior and dome strainer, minimum eight inches (8") deep, twelve inch (12") square top, double drainage flange, weepholes, bottom outlet, Nickel Bronze Rim and Secured Nickel Bronze 3/4 grate.

F. Provide deep seal cast iron traps with trap primer connections for all floor drains that are served by T.P. lines routed below the slab or floor and cannot connect to T.P. connection on drain body.

G. Trap Guards: Acceptable Manufacturer: ProSet Systems, Inc., or Jay R. Smith

- 1. Description:
 - a. Material: Smooth, soft, flexible, elastomeric PVC molded material molded into shape of duck's bill, open on top with curl closure at bottom.
 - b. Allows wastewater to open and adequately discharge floor drain through its interior.
 - c. Closes and returns to original molded shape after wastewater discharge is complete.

2. Compliance:
 - a. ASME A112.6.3.
 - b. NSF/ANSI 14.
 - c. CSA B 79.

2.3 VENT PIPE ROOF PENETRATION FLASHING

- A. Flash each vent pipe roof penetration as recommended by the roofing system manufacturer as specified under other sections of the specifications.
- B. Where vent pipes pass through the roof and no indication is made elsewhere in other sections of the specifications as to flashing requirements, use 4 lb. per Sq. Ft. minimum; seamless sheet lead rolled over the vent pipe to counter flash pipe.
- C. When lead flashing is required under the conditions noted in the above paragraph comply with the following:
 1. 24 Inches square minimum size at base of lead flashing.
 2. 8 Inches minimum clear on all sides of pipe.
- D. Install vandalproof vent caps similar to Smith No. 1748 to be the same size as vent pipes passing through the roof.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 1. Each plumbing fixture shall be individually trapped and vented with vent and waste stacks full size throughout.
 2. Install reducers, increasers, special flanges and fittings between piping and fixtures for complete installation, ready for use.
 3. Make offsets necessary to avoid construction interferences.
 4. Connect plumbing fixtures, drains, appurtenances, and appliances to receive or discharge liquid waste or sewage to sanitary waste system in accordance with requirements of local codes.
 5. Protect seal of fixture trap in plumbing system with properly installed vent.
 6. Coordinate floor drain locations with Drawings and other trades.
 7. Manhole covers shall be sealed gas tight. Provide gasketed seal as recommended by manufacturer.
- B. Slope:
 1. Slope horizontal drainage lines 2 inches and smaller 1/4 In per foot toward main sewer.
 2. Slope 3 inch and larger drainage lines 1/8 inch per foot
 3. Horizontal drain lines shall be run in straight lines uniformly sloped.
 4. Make changes in direction of flow of horizontal lines with wye and 1/8 bends.
- C. Vents:
 1. Extend vents above roof without reduction in size and terminate not less than 25 feet away from shaft, windows, or ventilating air intake openings.
 2. All vent and branch vent pipes shall be graded and connected to drip back to sanitary waste pipe by gravity.
 3. Extend vent lines at least 6 inches above flood level rim of vented fixture before offsetting.
 4. Extend all vents minimum of 18 inches above roof.

5. Offset vents in outside walls to penetrate roof at least 18 inches from outside walls.
6. Extend roof vent flashing onto roof surface minimum of 8 inches on all sides in accordance with the roofing system manufacturer's recommendations.
7. Coat metal sheet flashing with bituminous mastic where in contact with mortar or concrete to prevent direct contact with masonry materials.

D. Traps:

1. Equip each fixture, floor drain or piece of equipment connected to sanitary waste system with a trap.
2. Plumbing fixtures, except those having integral traps, shall be separately trapped by water seal P-traps placed as close to the fixture outlet as possible.
3. Provide trap with cleanout.
4. No fixture shall be double trapped.

E. Cleanouts:

1. Install in each change of direction greater than 90 degrees, at end of lines, base of risers, and other points necessary to permit cleaning of pipe sections.
2. Cleanouts shall be readily accessible.
3. Extend cleanouts on concealed piping through and terminate flush with wall, floor, or grade. Strictly coordinate cleanout cover plate location with the Architect for approved locations prior to pipe installation.
4. Space cleanouts not more than 50 feet apart for 3 inch pipe or less and not more than 100 feet apart for 4 inch and larger pipe.
5. If local requirements are more stringent than those indicated herein then those shall govern.
6. Cleanouts located at restroom batteries and/or at water closets shall be installed 12 inches above the flood rim of the water closet.

F. Drains:

1. Install floor, area, and equipment drains flush in the floor or basin to be drained unless indicated otherwise.
2. Locate drains in mechanical equipment spaces to conform with drain locations of equipment furnished.
3. Coordinate drain locations for Food Service equipment with rough-in drawings for such.
4. Coordinate with other trades to insure floors are sloped toward floor or area drains to provide positive drainage.

- G. Coordinate installation of vent flashing for all roof penetrations with other sections of the specifications.

3.2 FIELD QUALITY CONTROL

- A. Furnish instruments, equipment, and labor necessary to conduct tests.
- B. Test underground soil and waste piping before backfilling.
- C. Test drainage, waste, and venting piping with water before fixtures are installed.
- D. After plumbing fixtures have been set and traps filled with water, submit entire drainage, waste, and venting system to final test with smoke.
- E. Water Test:
 1. Apply water test to drainage, waste, and venting system either in its entirety or in sections.

2. If entire system is tested, tightly close openings in pipes except highest opening.
3. Fill system with water to point of overflow.
4. If system is tested in sections, each opening except highest opening of section under test shall be tightly plugged.
5. Fill each section with water and test with at least 10 foot head of water.
6. In testing successive sections, at least upper 10 feet of next preceding section shall be tested so that each joint of pipe in building except uppermost 10 feet of system has been subjected to test of at least 10 foot head of water.
7. Keep water in system or in portion under test for at least 60 minutes before inspection starts.
8. Repair any leaks discovered during test.
9. Repeat test until system holds water for six (6) hours without drop in water level.

F. Video Scoping:

1. Prior to start of construction, Contractor shall video scope the sanitary sewer mains. Any breaks, separations, bellies, or abnormality to sewer main shall be reported to the Midlothian Independent School District Project Manager.
2. At the completion of construction, the Contractor shall video scope the sanitary sewer mains and provide copies of video scope to the Midlothian Independent School District Project Manager

G. Final Smoke Test: At the completion of project where new sanitary sewer piping is installed and/or existing sanitary sewer piping is modified, the entire sanitary sewer system for the facility shall be tested as indicated below. MISD construction manager shall be notified (2) days in advance of when the test shall occur. Contractor shall document testing procedures, start time and time of completion. This information shall be included into the O&M manuals as part of the final close out documents.

1. Produce smoke by smoke machine.
2. Maintain pressure equal to 1 inch water column for 15 minutes before inspection starts.
3. Repair leaks discovered during test.
4. Repeat test until system holds smoke for ten (10) minutes without showing leaks.

END OF SECTION

SECTION 22 1400

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 01 - General Requirements and referenced documents.
- B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete storm drainage system as indicated herein and as indicated on the contract drawings.
- B. Provide an area drainage system within and to 5 feet outside building line or as otherwise indicated on the drawings.
- C. Provide a subsoil drainage system as indicated herein and as indicated on the Contract Drawings.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 30 00.
- B. Indicate on submittal piping material and joining method for each system and for the various sizes of piping systems to be installed. This shall be in tabular form in one location.
- C. Product Data:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining methods.
 - 4. Roof drains.
- D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction.
- E. Provide closeout documents as required in Division 1, Section 01 17 00.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in following order of precedence:
 - 1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing.
 - 2. Provisions specified in this Section.
 - 3. International Plumbing Code.
- B. Installer shall have been doing related work as described herein for a minimum of 5 years.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. Above ground:

- B. Schedule 40 PVC Piping Above Grade:
- a. Pipe 1-1/2 - 10 inches: Poly Vinyl Chloride (PVC) schedule 40, drain waste vent (DWV) pipe, ASTM D2466, ASTM D 2321, ASTM D2665 and ASTM 1785, NSF stamped and approved. System shall be rated for 200 psi minimum pressure.
 - b. Fittings 1-1/2 - 10 inches: Poly Vinyl Chloride (PVC) schedule 40, DWV patterned fittings, ASTM D2466 and ASTM 1784, NSF stamped and approved.
 - c. Solvent Cement: Shall comply with pipe and fitting manufacturer's recommendations and shall be a two (2) step process with Primer manufactured for thermoplastic piping systems and solvent cement per manufacturer and shall conform to ASTM D2564 and ASTM F656.

2.2 DOWNSPOUT BOOTS

- A. Downspout boots for connection to underground storm system shall be constructed of cast iron with one coat of rust inhibited primer applied at the factory, inlet shall match sheet metal gutter downspout dimensions, 6" diameter outlet, 60" long stock length.
- B. Refer to Architectural Plans for quantities and installation details.
- C. Acceptable Products: JR Hoe, N-Series, Piedmont B1 Series, Barrycraft B25C Series
- D. Secure boot per manufacturer's recommendations.

2.3 CLEANOUTS

- A. Acceptable Manufacturers:
1. Josam.
 2. Jay R. Smith.
 3. Wade.
 4. Zurn.
- B. Size: Cleanouts shall be same size as pipe up to 4 Inches; 4 Inch for 4 Inch and larger pipe.
- C. Cleanouts for Cast Iron Pipe: Tapped extra heavy cast iron ferrule, caulked into cast iron fittings.
- D. Cleanout Plugs:
1. Meet requirements of Plumbing Code, with American Standard pipe threads.
 2. Gasket Seal bronze plug.
- E. Cleanouts do not require special covers on lines in completely accessible pipe chases or in equipment rooms where piping is exposed.
- F. Pipe Fittings at Cleanouts: Make cleanouts turning out through walls and up through floor by long sweep ells or "Y" and 1/8 bends.
- G. Cleanout Cover Plates:
1. Provide face or deck plates for concealed cleanouts to conform to Architectural finish in room.
 2. Where no definite finish is indicated, wall plates shall be stainless steel and floor plates nickel bronze.
 3. Provide vandalproof screws.
- H. Acceptable Products:

1. In floor with Linoleum tile or vinyl tile finish:
 - a. Round Nickel Bronze top.
 - b. Scoriated top.
 - c. Smith No. 4051L-NB-U.
2. In floor with ceramic tile finish:
 - a. Square Nickel Bronze top.
 - b. Scoriated top.
 - c. Smith No. 4052L-NB-U.
3. In finished rooms flush with wall:
 - a. Vandal Proof Stainless Steel Center screw
 - b. Cleanout tee with Stainless Steel Round Cover.
 - c. Smith No. 4530Y-SS-U.
4. In fan or mechanical room floors with concrete finish and/or with floating floors:
 - a. Round Nickel Bronze Extra Heavy Duty top.
 - b. Secured Scoriated top.
 - c. Smith no. 4112L-NB-U.
5. In floors with carpet:
 - a. Continuous Carpet: Round Nickel Bronze top with Nickel Bronze Carpet Clamping Device (-X).
 - b. Carpet Squares: Round Nickel Bronze Scoriated top below carpet and screwed Stainless Steel Carpet Cleanout Marker. (-Y).
 - c. Smith No. 4032L-Y-NB-U or 4032L-X-NB-U.
6. For terrazzo floor finish:
 - a. Round Nickel Bronze top.
 - b. Scoriated top.
 - c. Smith No. 4051L-NB-U.
7. Exposed stack:
 - a. Duco Coated Cast iron cleanout "tee".
 - b. Gasket Sealed countersunk bronze plug
 - c. Smith No. 4511S-Y-U.
8. Underfloor chase:
 - a. Cast iron Cleanout body.
 - b. Gasket Sealed countersunk bronze plug.
 - c. Smith No. 4293L-U.
9. Vehicle Traffic Outside Grade:
 - a. Duco Coated Heavy Duty Cast Iron Round Cleanout Housing.
 - b. Scoriated Cast Iron Cover with Lifting Device.
 - c. Vandalproof screws
 - d. Cast iron cleanout ferrule and Gasket Seal Bronze Plug.
 - e. Smith No. 4262L-U.
10. Grade:
 - a. Duco Coated Extra Heavy Duty Cast Iron Top.

- b. Installed in concrete block 18" x 18" x 6", or surround each cleanout with a minimum of four inches (4") of concrete by six inches (6") thick, top of block shall be flush with finished grade.
- c. Smith No. 4232L-U.

2.4 AREA DRAINS

A. Area Drain AD-1:

- 1. Duco coated cast iron body and flashing clamp with seepage openings and Vandal Proof Square and Heel Proof Nickel Bronze Grate. Grate Openings must 3/8" or smaller.
- 2. Acceptable product: Smith No. 1410Y-NB-HP-C-U

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

- 1. Install roof drains, reducers, increasers, flanges, and fittings between piping and drains in accordance with manufacturer's recommendations.
- 2. Make offsets necessary to avoid construction interferences.
- 3. Protect piping from damage and corrosion.
- 4. Connect drains receiving water to storm drain system of building.
- 5. Coordinate precast trench and other types of grating system installations with Drawings.
- 6. Horizontal pipe and fittings six inches (6") and larger shall be suitably braced to prevent horizontal movement. This shall be done at every branch opening or change of direction by the use of braces, blocks, rodding, or other suitable methods, to prevent movement. Consult pipe manufacturer's recommendations for approved methods.

B. Slope:

- 1. Horizontal drainage lines 2 inches and smaller: Slope minimum 1/4 inch per foot toward main sewer.
- 2. Horizontal drain lines 3 inches and larger: Slope minimum 1/8 inch per foot toward main sewer.
- 3. Run horizontal drain lines in straight lines at uniform slopes.
- 4. Make changes in direction of flow of horizontal lines with Y and 1/8 bends.

C. Cleanouts:

- 1. Install in each change of direction 90 Degrees or greater, end of lines, base of risers and other points necessary to enable cleaning out of pipe sections.
- 2. Cleanouts shall be readily accessible.
- 3. Extend cleanouts on concealed piping through and terminate flush with wall, floor, or grade.
- 4. Cleanouts shall be not more than 50 feet apart for 3 inch and smaller pipe, and not more than 100 feet apart for 4 inch and larger pipe.

D. Insulation:

- 1. Provide insulation on body of roof drains and overflow drains, per Section 15250.
- 2. Provide insulation for all horizontal roof drain piping to a minimum of 3' from top of vertical riser concealed in chase. Extend insulation to crawl space where risers are exposed.

- E. Perforated subsoil drain piping shall be installed in continuous length around perimeter of building and tee into non-perforated subsoil drain line and drained to sump.

3.2 FIELD QUALITY CONTROL

- A. Furnish instruments, equipment, and labor necessary to conduct tests.
- B. Methods of sampling, inspecting, and testing shall conform to local codes.
- C. Test underground storm drainage piping before backfilling.
- D. Test storm drainage piping with water.
- E. Submit drainage system to final test with smoke.
- F. Water Test:
 - 1. Apply water test to entire system or in sections.
 - 2. If entire system is tested, tightly plug openings in pipes except highest opening.
 - 3. Fill system with water to point of overflow.
 - 4. If system is tested in sections, tightly plug openings except highest opening of section under test.
 - 5. Fill section with water to 10 foot head of water.
 - 6. In testing successive sections, upper 10 feet of next preceding section shall be tested so that each joint of pipe in building except uppermost 10 feet of system has been subjected to test of 10 foot head of water.
 - 7. Keep water in system or in portion under test for one hour before inspection starts.
 - 8. System shall than be made tight at all joints.
 - 9. Repair leaks.
 - 10. Repeat test until system holds water for six hours without drop in water level.
- G. Final Smoke Test:
 - 1. Produce smoke by smoke machine with pressure equivalent to 1 inch water column maintained for 15 minutes before inspection starts.
 - 2. Repair leaks.
 - 3. Repeat test until piping system holds smoke ten minutes without showing leaks.

END OF SECTION

SECTION 22 2113

PLUMBING PIPING SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 22 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 SYSTEM DESCRIPTION

- A. Furnish and install all piping of every kind required, specified, or shown on the Drawings for the installation of the work specified in Division 22. The location, direction, and size of the various lines are indicated on the Drawings. Lines for pilot and controls and instrumentation are not shown but shall be installed as required and as specified.
- B. Piping systems shall include all appurtenances shown on the drawings and specified herein.
- C. Valves or cocks shall be installed to control the flow of water to each of the various systems, to segregate individual items of equipment and parts of fluid circulating or supply systems, and to permit draining of systems or portions thereof, to blow-off strainers, etc., as directed on the Drawings and specified.
- D. The work shall include the furnishing and installing of all supporting structures and members for pipes, ducts, and equipment.
- E. Support devices and members shall include vibration and noise isolating devices and assemblies. Penetrations of walls to structure shall be sealed off to limit noise transmission through sleeves.
- F. **All material shall be manufactured in the United States and/or shall comply with the most current North America Free Trade Agreement, USMCA.**

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality.
- B. All equipment and materials shall be installed by experienced mechanics certified and trained for the work performed.

1.4 SUBMITTALS

- A. Product Data: Submit complete manufacturer's descriptive literature and installation instructions in accordance with Section 01 33 00 for all piping materials to be used for each system, valves and plumbing specialties as specified herein.
- B. Shop Drawings:
 - 1. Submit in accordance with Sections 01 33 00 and 22 05 00.
 - 2. Submit 1/4" = 1'-0" Plumbing Piping Shop Drawings.
 - 3. Overlay piping Shop Drawings over other Shop Drawings of other trades to include electrical and sheet metal Shop Drawings.
 - 4. Plan views of congested areas and sections thereof shall be drawn at a scale of 3/8" = 1'-0".

5. There is a minimum \$150.00 fee, payable to the engineer to obtain Auto Cadd files for this purpose. A "Release of Liability" form must be signed after which a single CD will be produced when payment is received.
- C. Fully coordinate all piping shop drawings with sheet metal shop drawings and other trades. Failure to submit shop drawings in a timely manner, as required to keep pace with the construction and work of all other trades, will result in delays, and possible stoppage, of payment to the Contractor. Additionally, no work may proceed until such shop drawings are submitted, reviewed, and found to be acceptable by the Engineer.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Storage and protection of materials shall be in accordance with Section 22 05 00.
- C. Take special precautions to protect control valve internals from construction dirt and debris. If valves are stored on site cover valve openings until just prior to installation but in no case shall valves be unprotected for more than 48 hours.
- D. Openings in piping system, boilers, pumps, valves and other heat exchangers shall be covered during the construction period to protect the interior accumulation of dirt and debris in these systems until immediately prior to connection to these components to similarly protected systems.

PART 2 PRODUCTS

2.1 FLANGES

- A. Flanges in welded lines for water systems shall be 150 pound forged steel, welding neck flanges, except where cast iron fittings are used as specified elsewhere in these specifications, and except as otherwise shown.
- B. Flanges in screwed ferrous lines shall be 125 pound cast iron or 150 pound forged steel screwed flanges.
- C. Where ferrous flanges connect to flat faced flanges on valves, items of equipment, etc., the companion flange shall be flush faced and where the flanges on items of equipment are raised face flanges, the companion flanges shall have raised faces.
- D. Flanges in copper lines shall be solder joint type cast brass flanges.
- E. Flange bolts and nuts shall conform to the applicable requirements of the latest edition of the Code for Pressure Piping.
- F. Slip-on welding neck flanges are prohibited.
- G. Flanges shall be Weldbend, Tube Turn, Hackney, or approved equals.

2.2 GASKETS

- A. Install gaskets between flanges of all flanged joints. Where used with brass or bronze flanges or with flat face ferrous flanges, they shall be full face type. For all other flanges they shall be ring gaskets properly cut to fit within the inside edges of the bolts.
- B. Gaskets in water lines shall be Garlock No. 24 Wire Insertion Red Rubber Sheet Packing, 1/16" thick and for any other systems use special materials suitable for the duty as recommended by their manufacturer.

2.3 INSULATING FITTINGS

- A. Except that no dielectric fitting shall be installed in connections between copper or brass and sanitary cast iron waste, drain and vent lines, wherever an interconnection is made between ferrous pipes or vessel and copper tubing or brass pipe, or vice versa, install a dielectric fitting.
- B. In lines assembled with screwed or soldered joints, use insulating couplings (unions) suitable for the intended service and where flanged connections are required, use insulating gasket material between flange faces, insulating grommets between bolts and holes in flanges and insulating washers under both bolt heads and nuts.
- C. PVC couplings of any kind shall not be acceptable for insulating couplings.
- D. Insulating fittings shall be suitable for the service medium, operating pressure and temperature. Fittings shall be rated for 1.5 times the normal system operating temperature and pressure in which installed.
- E. Insulating fittings shall be as manufactured by EPCO, Maloney, or Crane.

2.4 VALVES

- A. All valves of any one type shall be of the same make throughout and insofar as practicable all valves in a given category shall be of the same make.
- B. All valves shall be so located as to be readily accessible for operation and maintenance.
- C. Furnish and install all valves indicated on the Drawings, specified herein, and required to control the flow of water to and from various parts of the systems and to isolate various pieces of machinery and equipment and to isolate various parts of the systems.
- D. Each valve for installation in a line to be insulated shall have sufficient clearance between the valve body and the operating handle or device to accommodate the insulation.
- E. All valves shall be designed for re-packing under pressure when fully opened and shall be equipped with packing suitable for the service.
- F. Valves shall generally be installed with stems up; but, in no case, less than horizontal and whenever possible shall be grouped together in a uniform manner.
- G. Except where special valves are specified elsewhere herein or as required by special conditions or class of work, valves shall be equivalent to the following Nibco Co. valve numbers listed herein.
- H. All valves used for domestic water service shall be Lead-Free per the "Safe Drinking Water Act". U.S. Senate Bill S. 3874.
- I. Where cocks are required, they shall generally be brass, screwed pattern up to 2" and cast iron flanged pattern 2-1/2" and larger plug cocks suitable for the system pressure. Also provide and install all special cocks required such as pet cocks, gauge cocks, etc.
- J. Lead Free Check valves in pump discharge lines shall be flanged non-slam type silent check valves. Valves shall have a bronze body and be bronze fitted with stainless steel springs. Valves shall be rated for 125 PSIG WOG and be one of the following products:
 - 1. Nibco - 480 Series, or equal by
 - 2. Apollo 61LF-100.
 - 3. Hammond UP943 or UP947.
- K. Lead Free Swing Check Valves 2" and smaller shall be the Y-pattern swing-type manufactured in accordance with MSS-SP 80, and be Class 125 rated to 200 degrees F

or below, have bronze ASTM B-62 bodies with bronze discs. Swing check valves 2" and smaller shall be of the following:

1. Nibco - T/S-413-B.
2. Apollo 161 T/S-LF.
3. Milwaukee UP509 or UP1509.
4. Hammond - UP904 or UP912.

- L. Lead Free Swing Check valves 2-1/2" and larger shall be the swing-type manufactured in accordance with MSS-SP71, be Class 150 rated for 200 degrees F. or below, be flanged, have ASTM A126, Class B, cast iron bodies with bronze trim, and have non-asbestos gaskets. Swing Check valves 2-1/2" and larger shall be one of the following:

1. Nibco - S-433-B, or equal by
2. Apollo.
3. Milwaukee.
4. Hammond.

- M. Bronze Full Port Lead-Free Ball valves: 2" and Smaller:

1. Ball valves shall be on the following products:
 - a. Nibco T-585-66-LF or S-585-66-LF.
 - b. Apollo 77CLF-140 Series.
 - c. Hammond UP8301A or 8311A.
2. Ball valves shall be full port design with stainless steel ball and stem.
3. All ball valves shall be manufactured from a dezincification resistant material with less than 15% zinc.
4. Provide extended lever handles for all valves installed in insulated lines where insulation is not chamfered as detailed in the documents.

- N. Provide Venturi splitter valve with integral isolation valves, unions, EPDM seals at locations within the domestic hot water supply system to maintain domestic hot water loop temperatures and supply within required distances as listed with the IECC. Acceptable product: Kemper – KHS-651-06 Series.

- O. All valves, valve packing material, gaskets, pipe threading compound, etc., shall be compatible with ethylene glycol, without exception. Typically, use EPDM valve packing materials. No teflon materials are allowed. Indicate compliance on submittals.

2.5 PIPE HANGERS

- A. Pipe hangers, except for fire protection types, shall be as manufactured by Anvil International, Inc. and be of a type suitable for each use. Approved equals by Mason Industries, Inc., B-Line, Grinnell, and PHD Manufacturing, Inc. will be considered.
- B. For cast-iron pipes up to three inches (3") in size, use Anvil Fig. 104 malleable iron, adjustable, split ring, swivel hanger, or Anvil Fig. 590 steel clevis hanger. For cast iron plumbing piping four inches (4") and larger, use only Anvil Fig. 590 steel clevis hanger.
- C. For PVC, CPVC, PVDF, Polypropylene pipe sizes up to three inches (3") in size, use Anvil FIG. 104 malleable iron, adjustable, split ring, swivel hanger, or Anvil FIG. 590 Steel Clevis hanger. For sizes four inches (4") and larger, use only Anvil FIG. 590 Steel Clevis hanger.
- D. Domestic cold and hot water piping 3/4" in size up to and including twelve inches (12"), shall be Anvil Fig. 260, adjustable clevis hangers. Hangers shall be sized to be on the outside of the insulation.

- E. Where several pipes are routed parallel to each other and at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where rollers are called for elsewhere by these specifications.
- F. For bare copper pipes (uninsulated only) up to and including three inches (3") in size, use Anvil Fig. CT-109 malleable iron, copper plated, split ring, hangers or Anvil Fig. CT-65 copper plated clevis hangers. For uninsulated copper pipes larger than three inches (3"), use Anvil Fig. CT-65 copper-plated clevis hanger.
- G. Hanger rod sizes shall conform to the following schedule:

Pipe up to, and including 2"	3/8" rods
Pipe 2-1/2", 3", and 3-1/2"	1/2" rods
Pipe 4" and 5"	5/8" rods
Pipe 6"	3/4" rods
Pipe 8", 10" and 12"	7/8" rods
Pipe 14", 16" and 18"	1" rods
Pipe 20" up to 30"	1-1/2" rods

- H. Unless shown otherwise on the Drawings, all horizontal runs of steel piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and 3"	12 feet
Pipe 3-1/2" and 4"	12 feet
Pipe 5" and 6"	*8 feet
Pipe 8" and larger	*8 feet
* Maximum 8 foot spacing for pipe supports for pipes 5" and larger due to structural considerations.	

- I. Unless shown otherwise on the Drawings, all horizontal runs of cast-iron piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	5 feet
Pipe 1-1/2" and 2"	*5 feet
Pipe 2-1/2" and 3"	*5 feet
Pipe 3-1/2" and 4"	*5 feet
Pipe 5" and 6"	*5 feet
Pipe 8" and larger	*5 feet

<p>* Maximum horizontal spacing of cast-iron pipe hangers shall be increased to 10 feet where 10-foot lengths of pipe are installed.</p>
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- J. Unless shown otherwise on the Drawings, all horizontal runs of "Poly" thermoplastic type piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	4 feet
Pipe 1-1/2" and 2"	4 feet
Pipe 2-1/2" and 3"	4 feet
Pipe 3-1/2" and 4"	4 feet
Pipe 5" and 6"	4 feet
Pipe 8" and larger	4 feet

- K. Unless shown otherwise on the Drawings, all horizontal runs of copper piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 3/4" in size	6 feet
Pipe 1" and 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and larger	12 feet

- L. There shall be a hanger within two feet (2') for any ferrous or copper piping and eighteen inches (18") for any "poly" thermoplastic type pipe of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps. Vertical pipes within a space shall have not less than two (2) supports. Where the vertical run of pipe in a space exceeds 14 feet then three (3) supports shall be required.
- M. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.
- N. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Anvil Fig. 281, wedge type, concrete inserts. All inserts shall be pre-treated to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.
- O. Expansion bolts shall be Ackerman-Johnson.
- P. Beam clamps suitable for the use with the type of steel construction involved shall be an Anvil product or an approved equal as indicated elsewhere herein.

- Q. No perforated straps shall be used to support any mechanical equipment item or piping of any kind.
- R. Potable and non-potable domestic cold water, domestic hot water (includes recirculated lines), horizontal and vertical storm drain downspouts and soil piping receiving cold condensate piping hangers shall be sized to go around the insulation with shields being provided to protect the insulation. Shields shall be Anvil Fig. 167.
- S. All steel hangers, base plates, supports, nuts, bolts, and all thread rod located outdoors, in crawl spaces, and exposed to the weather, shall be made of galvanized steel or equally suitable corrosion resistant steel alloy or aluminum. Where steel components are allowed and used under these conditions they shall be painted with an equivalent protective coating similar to a two-part epoxy. Refer to Section 09 90 00.
- T. For pipe sizes 8" and under use Anvil Fig. #93 and 94 beam clamps. For pipe sizes 10" through 18" use Anvil Fig. #66 in the "U" position.

2.6 SLEEVES AND ESCUTCHEONS

- A. Generally where pipes pass through interior building walls or floors above the first floor (out of the ground), 22 gauge galvanized sheet metal sleeves shall be used. Sleeves shall extend a minimum one inch (1") above a floor or beyond the wall, as applicable.
- B. All pipes penetrating grade beams, exterior walls, concrete structural members, or concrete slabs of mechanical equipment rooms on the first floor shall generally use standard weight galvanized steel pipe as the sleeving material.
- C. For concrete or masonry walls, sleeves shall be inserted into the masonry, decking or form work prior to the pouring or placement of concrete or masonry units to create a leave out.
- D. The sizes of all sleeves shall be such as to permit the subsequent insertion of the intended pipe of the proper size with adequate clearance for movement due to expansion and contraction. In the case of insulated lines, the diameter of the sleeves shall be at least 1/2" greater than the outside walls of the pipe with specified thickness of insulation. This will require that the inside diameter of galvanized steel pipe sleeves be at least 1/2" greater than the outside diameter of the service pipe with insulation. Galvanized steel pipe sleeves set in floors shall project two inches (2") above the floor.
- E. After the pipes are installed, fill the annular space between the pipe, and insulation as required, and its sleeve with an approved mastic or caulk. Use loose fibrous insulation packing as required to accomplish this. In all cases the annular spaces around the pipes within the sleeved openings shall be filled with loose fibrous insulation and then sealed with an approved caulking or expanded foam insulation.
- F. Escutcheons, except as specifically noted or specified, shall be installed on all pipes passing exposed through floors, walls, or ceilings. Escutcheons shall be equal to the Crane No. 10, chrome plated sectional floor and ceiling plates, and shall fit snugly and neatly around pipe or pipe insulation or insulated lines. Solid chrome plates with set screws shall be used if sectional plates do not fit properly or stay in place. Where multiple pipes penetrate floors or walls in close proximity in concealed areas, shop made sheet metal escutcheons may be used.
- G. Pipes sleeved through grade beams open to basements, crawl spaces or void spaces below grade shall additionally receive "Link Seal" or equal closures made of interlocking synthetic rubber links. Seals shall provide for absolute water tightness. Seal shall be constructed to insulate electrically pipe from wall. Install as recommended by manufacturer. Provide Century-Line sleeves with water stop and anchor collar for pipes penetrating grade beams designated to be anchored.

- H. Where PVC pipes, 3 inches and smaller, and small copper water piping under 2 inches in size, penetrated a horizontal floor slab a metal sleeve will not be required. For these piping systems, completely wrap the piping with a polyethylene tape, or wrapping. This tape shall be minimum 4 mils thick and shall be wrapped at least two times around the pipe and secured sufficiently to hold the wrap in place during the pouring of the slab. This wrap shall be in sufficient length or height to insure that no concrete will be in contact with the pipe. All other piping shall be sleeved as indicated elsewhere herein.
- I. Refer to Section 22 05 00 for additional requirements of penetrations through fire-rated assemblies.

2.7 ACCESS DOORS

- A. Wherever access is required above inaccessible ceilings, in walls, furrings, chases or soffits to physically reach concealed piping, or equipment installed under Division 22, provide access doors of sufficient size to maintain, repair, replace or suitably access devices intended to be adjusted as indicated herein.
- B. Provide an access door or panel for each of any valves, group of valves, damper pull rods, splitter dampers, manual volume dampers, actuators or other controlling mechanism installed under Division 22 which would otherwise be concealed in the building construction with no access.
- C. All access doors in toilet rooms, locker rooms, showers, kitchens, or other similar wet areas shall be the flush mounted type and be made of brush or satin finish stainless steel as manufactured by Milcor or Elmdor.
- D. All access doors shall be minimum 18" x 18", unless noted otherwise, in size unless otherwise approved in writing in advance by the Engineer. Doors shall be increased in size as required to allow for a person to reasonably access, adjust, maintain, service, inspect or replace the largest single component concealed. Provide special sizes of access doors as required.
- E. Coordinate the final location of all concealed equipment and devices requiring access with the final location of the required access panels or doors. Allow ample space for the removal of all parts and equipment that require replacement or servicing.
- F. Where mounting heights are not detailed or dimensioned, install mechanical piping and overhead equipment to provide the maximum headroom possible while maintaining reasonable access and service to those items being accessed.
- G. All serviceable equipment shall be within immediate reach (maximum of 12") from the access door.
- H. Install all access doors in locations to suit the intended purpose but have each location reviewed and approved by the Architect. In no case shall access doors be located such that the intended purpose is rendered useless.
- I. Access doors shall all have spring concealed hinges, screwdriver operated cam latches, be the flush mounted type, open up to, but not more than, 175 degrees, be made of steel, or stainless steel to suit the application, be fire rated (U.L. rated) to match the rating of the surface where the door is placed, and have a powder coated electrostatic primer paint on all steel doors. Furnish the following access door types as described below:
 - 1. Milcor Style DW - Flush drywall type with frame made of 16 gauge steel, panel door made of 14 gauge steel, galvanized steel drywall bead on frame, and removable hinge pins for removal of panel door. Provide minimum of two hinges (18" x 18" and larger) up to 24" x 24" in size and three hinges on access doors above this size. Provide a minimum of three cams on access doors.

2. Milcor Style K - Flush plaster wall or ceiling type made similar to Style DW except with a 22 gauge expansion casing bead, two hinges on 18" x 18" access doors with either side no larger than 24", three hinges on doors with any dimension of 24" or larger, minimum one cam on doors with no dimension larger than 18" and two or more cams on larger access doors.
3. Milcor Style M or MS - Flush drywall, masonry or tile type made similar to Style DW except with 14 gauge steel frame and doors (16 gauge when made of stainless steel-satin finish), one hinge on access doors up to 18" x 18" in size, two hinges on sizes 20" x 24" and 22" x 22", three or more hinges on sizes 24" x 24" and larger, and the number of cams as standard with the manufacturer.
4. Provide other types of access doors suitable for the application to include surface mount, double leaf for access doors exceeding 36" in any dimension, louvered where indicated on the Drawings, fire rated, recessed or security/detention types as required and compatible with the surface penetrated.
5. Acceptable manufacturers: Elmdor or Milcor.

2.8 STRAINERS

- A. Strainers shall be of the FDA approved, heat fused epoxy coated (interior and exterior) "Y" pattern type bodies, unless shown or specified otherwise. Body ends shall be screwed or flanged to match the type of joints in the piping in which the strainers are installed. Strainers shall have a 200 psi non-shock, ANSI B16.1 pressure rating. Watts 77F-DI-FDA-125, or Engineer approved equal.
- B. Each strainer, screen, or mesh shall be of Type 304 Stainless steel, brass, or monel construction. Screen or mesh sizes shall be as scheduled below:

Pipe Size	Screen/Mesh Size
1/2" - 2"	20 Mesh
2-1/2" - 3"	0.045 Perforations
4" - 12"	0.125 Perforations

- C. Where vertical space does not permit the installation of the "Y" strainer, install an equivalent basket strainer.
- D. Strainers shall be of the FDA approved, heat fused epoxy coated (interior and exterior) "Y" pattern type bodies, unless shown or specified otherwise. Body ends shall be screwed or flanged to match the type joints in the piping in which the strainers are installed. Strainers shall have a 200 psi non-shock. ANSI B16.1 pressure rating. Watts 77F-DI-FDA-125, or Engineer approved equal.
- E. Lead Free Bronze Strainers for screwed piping shall be Watts LF777 Series (cast bronze body) with bronze plug stainless steel mesh strainer for copper piping; piping shall be Watts CI-125 or F-125 and CI-250 or F-250 (cast iron bodies). Equivalent as manufactured by the following will be considered:
 1. Nibco.
 2. Hammond.
 3. Apollo.
 4. Milwaukee.

2.9 GAUGES AND GAUGE COCKS OR NEEDLE VALVES

- A. Provide the following pressure gauge cock or needle valve connections:
1. At the suction and discharge of each pump.
 2. At the domestic water riser, downstream of main isolation valve.
 3. Downstream of the building main backflow preventor.
 4. At the inlet and outlet of pressure reducing stations.
 5. At circuit setter balance stations and any other points indicated or detailed on diagrams on the Drawings.
 6. At the inlet and outlet of circulation pumps.
- B. Where gauge connections are installed in insulated lines, install gauge cocks or needle valves on a nipple of sufficient length that the gauge cock or needle valve handle will be free of the pipe insulation. Position each gauge cock in relation to surrounding piping and equipment so that the gauge may be easily read and so that a gauge having a 4" diameter dial can be screwed into and out of the piping nipple where the gauge cock or needle valve is installed. All gauge cocks shall be of the tee-handle type. Needle valves shall be a Weksler AV32, AV34, or BBV4.
- C. Install gauge cocks or needle valves at pumps at the pump suction and discharge flange connections at the pre-drilled and tapped gauge connections as provided by pump manufacturer.
- D. Furnish and install a pressure gauge suitably calibrated at each of the following locations:
1. At the suction and discharge of each pump.
 2. At the domestic water riser, downstream of main isolation valve.
 3. Downstream of the building main backflow preventor.
 4. At the inlet and outlet of pressure reducing stations.
 5. At circuit setter balance stations and any other points indicated or detailed on diagrams on the Drawings.
 6. At the inlet and outlet of circulation pumps.
- E. Gauges shall be of the bourdon tube type, glycerin filled, and shall be selected to operate at about the midpoint of their full range, i.e., for a 50 PSI operation, select a gauge of 0 to 100 psi. Each gauge shall be provided with a brass lever handle union cock or brass handle needle valve. Cases shall be Stainless Steel, not less than four inches (4") in diameter.
- F. Pressure gauges shall be equal to Weksler Model 401L-4-PD with type ASD case, phosphor bronze with phosphor bronze brushed rotary movement and link; 4" dial, nickel plated ring, free standing stainless steel case; equipped with micrometer adjustment pointer. Provide each gauge with scale range suitable for the duty.
- G. Provide pulsation dampeners, adjustable snubbers, or piston type pressure snubbers in line with all pump gauges.
- H. Cocks and gauges shall be manufactured by:
1. Crosby.
 2. Weksler.
 3. Marsh.
 4. Terice.
 5. Miljoco.
 6. Weiss.

2.10 THERMOMETERS AND THERMOMETER WELLS

- A. Furnish and install brass or stainless steel closed separable thermometer wells for all thermometer and controller bulbs which are designed for liquid measurements. Whenever a thermometer or controller bulb is inserted in a pipe for either remote or local temperature indication or control, locate the thermometer well so that it will be completely surrounded by flowing fluid. Such thermometer locations as are shown on the Drawings are diagrammatic only. Install thermometer wells for maximum effectiveness and in the case of locally indicating instruments, for easy readability.
- B. Supply each brass test well for use with the stem thermometers, a threaded brass plug and keeper chain. Install these test wells in the following locations such that they can be filled with oil to facilitate temperature measurements:
1. At the inlet and outlet of each water coil.
 2. At the inlet and outlet of each heat exchanger, evaporator and condenser.
 3. At the discharge of each modulating 3-way control valve.
 4. At other locations as specified herein or shown on the Drawings.
- C. Where thermometer wells are called for, furnish and install brass wells with the tip of the well extending into the water stream. The well shall have a plug attached to it with a short length of chain. The wells shall be installed in the vertical or at 45 degree angle up.
- D. Thermometers shall be of the industrial type with red spirit filled liquid (no mercury allowed), bronze enameled aluminum cases, glass fronts, 9" scales, separable sockets; straight or angle pattern so selected that they can be read from the floor. Straight type equal to Weksler Type 105 and angle type equal to Weksler Type 115, Type 125, or Type 135, depending upon the angle and aspect. Furnish thermometers with 2-1/2" stem extensions where they are installed in insulated lines. Select scale ranges for maximum readability at the design temperature of the medium being measured.
- E. Thermometers shall be installed in the following locations:
1. At the discharge of each pump or Blending Station valve.
 2. At the inlet and outlet of each heat exchanger, evaporator and condenser.
 3. At other locations as specified herein or shown on the Drawings.
- F. In lieu of the industrial stem type thermometers 5" dial silicon filled bi-metal thermometers with vari-angle feature or "solar only" self-powered digital thermometers (no batteries allowed) with sealed sensor technology, minimum 1/ 2" tall LCD digit size display, 1% accuracy, and variable angle stem assembly shall be allowed.
- G. Thermometers and thermometer wells shall be as manufactured by:
1. Weksler.
 2. Terice.
 3. Marsh.
 4. Taylor.
 5. Miljoco.
 6. Weiss.

2.11 TEMPERATURE AND PRESSURE TEST PORTS

- A. Temperature and Pressure Test Ports, or Pete's plugs, shall be dual valve type with valve pocket between valves, retaining cap with gasket and cap "saver" connector.
- B. These ports may be used at water coil connections in lieu of gauge cocks or needle valves and thermometer test wells.

- C. Pete's plugs shall have the pipe nipple extended to beyond the insulation thickness to make the plug fully accessible and a minimum of one inch (1") above the pipe insulation.
- D. Ports shall be as manufactured by:
 - 1. Pete.
 - 2. Autoflow.
 - 3. Flowset.

2.12 RELIEF VALVES

- A. All closed water systems shall be protected with a relief valve. Valves shall be spring operated, all brass, and shall meet A.S.M.E. requirements for discharge capacities. Discharge lines shall be piped to the nearest floor drain.
- B. Relief valves shall be as manufactured by Watts, Klipfel, McAlear, or McDonnell and Miller.
- C. Provide atmospheric relief piping routed to the outdoors as required by local code for all steam and natural gas systems.

2.13 AIR VENTS

- A. Provide and install air vents, air eliminators, where shown and at any high points or traps in water circulating lines where air might collect.
- B. Each such air vent shall be installed with a valve at its inlet and shall discharge through an integral check valve. The waste lines from the discharge from air vents shall be collected and piped to the nearest floor drain in each case.
- C. All automatic air vents shall have cast or ductile iron bodies with corrosion resistant bolts, Buna-N or EPDM seating materials to meet system pressure and temperature requirements, and all stainless steel internal control components.
- D. Provide manual air vent cocks, or needle valve, for all water coils where not integral or supplied with coil by manufacturer.
- E. Automatic air vents shall be rated for a maximum working pressure of 150 psig and 250 Deg.F.
- F. Automatic air vents shall be as manufactured by:
 - 1. Hoffman No. 792.
 - 2. Armstrong No. AAE-750.
 - 3. Bell & Gossett No. 107A.
 - 4. Or equivalent by Amtrol.

2.14 VACUUM RELIEF VALVE

- A. All bottom feed domestic water heating equipment shall be protected by a vacuum relief installed on the cold water inlet pipe. Valve shall be compliant with ANSI Z21.22.
- B. Acceptable Product: Watts N36-M1 or Apollo VR12.

PART 3 EXECUTION

3.1 PIPING - GENERAL

- A. Where special classes of piping are involved and are not listed, the Contractor shall request instructions from the Owner's Representative as to the class of material involved and the method of fabricating it before ordering any material. All steel lines 2-1/2" and

larger shall be assembled by welding. All steel lines 2" and smaller may be assembled either by welding or by screwed fittings as specified.

- B. Welding shall be done by mechanics who satisfy qualification requirements of the American Welding Society. The pipe ends to be welded shall be machine beveled wherever possible. Gas cuts shall be true and free from all burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no metal shall project within the pipe. Fully ream, to the full inside pipe diameter dimensions, the inside of all piping to be welded. Miter joints will not be allowed in any case. All headers, connections, elbows, reducers, flanges, and special flanges and special fittings shall be made using forged steel welding fittings of the same weight as the pipe to which they are attached. All unions and connections to valves 2-1/2" and larger shall be made by the use of welded flanges.
- C. Branches in lines where the branch side is equal to 2/3 of the size of the main or smaller may be connected by using Weldolets or Thredolets; where the sizes are greater than 2/3 of the main, standard weight seamless tees as manufactured by Tube-Turns or Grinnell, A.S.T.M. Standard A-234 shall be used.
- D. The location, direction, and size of all lines are generally indicated on the drawings. Branch connections in general are indicated and shall be so installed as to provide proper grades.
- E. All lines shall be made up straight and true at proper grades. All water filled and condensate drain lines shall grade down to drains.
- F. Piping shall follow as closely as possible the routes shown on the plans and take into consideration conditions to be met at the site. Should any unforeseen conditions arise, lines shall be changed or rerouted as required after proper approval has been obtained.
- G. All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which the lines are connected.
- H. All headers shall be assembled as indicated using welding fittings throughout.
- I. All screw joints shall be made with taper threads, properly cut. Joints shall be made tight with graphite and oil applied to the pipe threads only and not to the fittings.
- J. Dielectric couplings shall be installed where ferrous pipe joins copper lines and shall be rated for the intended medium pressure and temperature or service.
- K. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of systems. No unions will be required in welded lines or lines assembled with solder joint fittings except at equipment items or coils, machinery items and other special pieces of apparatus. Unions in 2" and smaller lines shall be ground joint and unions 2-1/2" and larger shall be flanged unions. Unions shall be the same material and strength as other fittings in the lines. Companion flanges on lines at various items of equipment, machines, and pieces of apparatus shall serve as unions to permit removal of the particular item.
- L. All piping shall be supported by hangers independently of equipment connections. The weight of the piping and its contents shall not be imposed on the equipment in any way.
- M. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.
- N. Swing joints or expansion loops shall be provided wherever shown on the Drawings or wherever else necessary to allow for the expansion and contraction of piping. This shall

be accomplished in an approved manner and this Contractor shall be responsible for any damage which may occur as a result of expansion and contraction of his piping.

- O. Nipples shall be of the same size and material as the piping in the system in which the nipples are installed, except that "close", or "all thread" nipples shall not be used.
- P. Keep all open ends of piping in each system plugged or capped to prevent dirt or other debris from entering the pipe at any and all times during construction and before fixtures or equipment is connected. All piping shall be flushed clear prior to connection to the central building systems.
- Q. The ends of all piping furnished and installed in all systems shall be thoroughly reamed to the full inside diameter of the respective pipe.
- R. Exposed and concealed lines shall be run parallel with, and perpendicular to building lines and wherever possible shall be grouped together for easy service and identification. Whenever possible, horizontal and vertical runs shall be held as close as possible to the walls, ceilings, struts, members, etc., so as to occupy the minimum space consistent with the proper installation requirements for insulation, conduit, ductwork, lighting fixtures, etc., and the expansion requirements of each of these items and the building proper or the removal of the respective or adjacent pipes, conduits, and ductwork, and to allow for necessary access to valves, other pipes, conduits, dampers, etc.
- S. Valves required for control or isolation of any part of the various systems shall be provided and shall be located in approved or accessible positions or made accessible through removable panels, etc., and where several valves are related as to function, they shall be grouped in a battery. Request approval from Owner's Representative for proper location of all access panels required for valves, etc.
- T. All automatic control valves shall be installed such that the valve stem is pointed upwards, vertical, and in no case shall it be mounted at less than a 45 degree angle from the vertical position unless specifically approved by the Engineer prior to installation.
- U. All shut-off and isolation valves shall generally be installed with valve stems pointed vertically upwards. In no case shall valve stems be pointed downwards or less than in a horizontal position.
- V. Where new lines are indicated to connect into existing lines, careful coordination shall be exercised to determine exact elevations and locations of existing lines, to establish grades of interconnecting new lines, to establish procedures to interconnect lines, and to establish other details.

3.2 CROSS CONNECTION AND INTERCONNECTIONS

- A. No plumbing fixtures, device, or piping shall be installed which will provide a cross connection or interconnection between a distributing water supply for drinking or domestic purposes and a polluted supply such as drainage system, or a soil or waste pipe which will permit or make possible the backflow of sewage, polluted water, or waste into the water supply system.

3.3 EXCAVATION AND BACKFILLING

- A. Provide necessary excavating and backfilling for the installation of work specified in this Division as specified in Section 22 05 00 and 31 23 00. Shall comply with ASTM 2321.

3.4 FLASHINGS

- A. Flash around all pipes passing through the roof with sheet lead, as specified in Section 07525, built a minimum of 10" into the roofing, in all directions from the outside of the

pipe running up the pipe a minimum of 10" and more where vent terminals must be higher to conform to the requirements of the local Plumbing Code in effect, and then turned over one inch (1") into the pipe cavity. All seams and joints shall be completely soldered closed and the entire flashing shall be completely waterproof.

- B. Make all roof penetrations in accordance with the roofing system manufacturers approved methods and as specified in Section 07 52 50.

3.5 PIPE INSULATION INSERTS AND SHIELDS

- A. Provide a section of Foamglas insulation, calcium silicate, or urethane of thickness specified at hanger support locations and provide No. 16 gauge galvanized steel protection shield minimum 12" long. Shield shall be full half cylinders equal to Grinnell Fig. 167.
- B. Refer to Section 22 07 00, Insulation.

3.6 SAFETY GUARDS

- A. Furnish and install all safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction.
- B. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

3.7 TESTING AND REPAIRING

- A. During the progress of each portion of the work or upon its completion, make such tests of this work as herein specified, or as required by the Architect, or by State or Municipal Bureaus having jurisdiction and under their supervision.
- B. Provide all apparatus, temporary piping connections, or any other requirements necessary for such tests. Take all due precautions to prevent damage to the building and its contents incurred by such tests as will be required to repair and make good, at no cost to the Owner, any damage so caused. Testing of piping to be insulated shall be done before insulation is applied.
- C. Perform any other tests as may be required by the Owner's Representative to indicate the fulfillment of specification requirements.
- D. Pressure piping systems shall be tested with either water or air to a pressure of 150 psig or to 1-1/2 times the operating pressure, whichever is the greatest, for six (6) hours.
- E. Domestic hot and cold water piping shall be tested at 1.5 times the operating pressure or 150 PSIG, whichever is greater, for six (6) hours. Any leaks developed shall be made tight and the test repeated. Test pressure shall not be applied to specialties, but joint shall be tested for leaks at operating pressure when complete.
- F. Waste and vent piping shall be tested at completion of the rough work and before fixtures and traps are connected. Openings, except tops of bends, are to be plugged and the system completely filled with water. System shall stand without leak or loss of water for a period of not less than four (4) hours.
- G. Systems shall be tested in portions as required by the construction schedule and the portions being tested shall be effectively isolated and sealed off. When previously tested sections are connected into other sections, tests shall be rerun to include the new connections.
- H. Partial systems shall be tested prior to connecting into existing lines.

- I. Leaks in screwed joints shall be repaired by tightening the joint until the leak has stopped, or by remaking the joint if tightening fails to stop the leak. Leaks in welded joints shall be repaired by chipping out the weld around the leak and rewelding until it is stopped. Leaks in caulked joints shall be completely stopped by additional caulking of the joint, but, if that fails, the joint shall be re-made. A leak in a compression joint shall be repaired by remaking the joint using a new seal, compression ring, coupling, etc., as required. Leaks in soldered joints shall be repaired by remaking the joint and no soldering or brazing over existing joints will be permitted. Any defective piping shall be replaced.
- J. Additional testing shall be as specified in the individual Sections of these Specifications.
- K. During testing and cleaning of piping systems, use a fine mesh, 20 mesh or smaller, start-up strainer screen for all strainer pipe sizes. After piping system is cleaned each strainer shall be taken apart, cleaned, and final strainer mesh shall be placed back in strainer for normal operating conditions.

3.8 SEALING PENETRATIONS

- A. Seal all pipe penetrations through walls run to structure, ceilings, floors and roofs. Fill the annular space between the insulation on the pipe, or the pipe only where uninsulated, and its sleeve, with neoprene or non-hardening sealant.
- B. No pipe or duct shall be allowed to contact its surrounding sleeve or the wall, floor, or ceiling. Effective isolation shall be provided as described in Section 23 05 48 to the end that no vibration or direct noise transmission shall be transmitted. Vibration transmission limits shall be as established in Section 23 05 48. Use special materials as may be required to comply.
- C. Firestop pipe and duct floor and wall penetrations as specified in Section 07 84 00 and 22 05 00.

3.9 PAINTING

- A. All equipment specified in Division 22 shall be delivered to the site with suitable factory finishes as specified elsewhere herein.
- B. Items with factory applied finishes shall be protected during installation and other construction work. Damaged factory applied finishes shall be refinished to match the original finish appearance.
- C. Field painting of items specified and installed in Division 22 shall be as specified in Section 09 90 00.
- D. All ferrous metals that are not galvanized or made of a corrosion resistant alloy shall be painted. This shall include steel pipe hangars, trapeze supports, pipe stands, all thread hangar rods and other miscellaneous systems.

END OF SECTION

SECTION 22 3000

DOMESTIC WATER HEATING EQUIPMENT AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 01 - General Requirements and referenced documents.
- B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other sections of the specifications, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete and operational system of Domestic Water Heating Equipment and Accessories as indicated herein and as indicated on the Drawings.
- B. Completely coordinate specified herein work of all other sections of these specifications.
- C. Furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a complete and satisfactory operating installation, whether such work is specifically indicated or not.

1.3 QUALITY ASSURANCE

- A. Factory Testing: Subject each tank to a factory hydrostatic test pressure of 150 percent of the expected maximum system working pressure and certify that components are free of leaks prior to shipment to the project site. Tank shall have a minimum pressure rating of 150 psig.
- B. Manufacturing Standard: Tank shall comply with the ASME Pressure Vessel Code, Section IV.
- C. Each water heater (and/or heat exchanger and storage tank) shall have a written unconditional one (1) year cost free service policy, and a written full three (3) year parts and labor warranty against tank failure due to rust, corrosion, or electrolytic action.
- D. Each heater shall be UL Listed and Labeled.
- E. Each water heater tank shall have fiberglass insulation to meet ASHRAE Standard 90-1b for heat loss and protected by epoxy coated metal jacket.

1.4 SUBMITTALS

- A. Project Data:
 - 1. Operating and Maintenance Data, three (3) copies.
 - 2. Furnish factory obtained State Inspection Report and Stamp.
 - 3. Manufacturer's approved Startup Report completed by factory trained and authorized technicians to be furnished to Engineer.
 - 4. Written Equipment Warranties, complete and filled out.
- B. Product Data:
 - 1. Electric Storage Water Heaters.
 - 2. Thermal Expansion Tanks.
 - 3. Circulating Pumps, Aquastat and programmable timer.
 - 4. Thermostatic Mixing Valves.

PART 2 PRODUCTS

2.1 ELECTRIC STORAGE TYPE WATER HEATERS (6 GALLONS THROUGH 90 GALLONS)

- A. Provide in each location shown on the Drawings, a glass-lined electric storage type water heater of the size and capacity indicated. Heating elements shall be suitable for electrical current having the characteristics indicated on the drawings. Each heater shall be U.L. Listed and Labeled.
- B. Provide factory installed with dial thermostat, high temperature cut-off switch and high temperature and pressure relief valve. Valve shall be of the size and type to meet ASME standards for discharge capacity. Pipe relief valve full size to an approve drain.
- C. Tank shall be glass lined internally with alkaline borosilicate composite fused to steel by heating to 1600 Deg.F. Tank shall be furnished with a magnesium anode for corrosion protection.
- D. All tanks shall be insulated to meet ASHRAE 90.1b for standby heat loss.
- E. Each tank shall be equipped with necessary operating controls.
- F. Acceptable manufactures:
 - 1. A.O. Smith
 - 2. Rheem/Rudd

2.2 THERMAL EXPANSION TANKS

- A. Furnish and install a steel pressure vessel furnished with either a stainless steel or galvanized steel head. The pressure vessel shall be designed and constructed per ASME Section VIII, Division 1, with a maximum allowable working pressure equal to or greater than the water heater but no less than 125 psig. Tank shall be equipped with FDA approved heavy duty butyl rubber bladder or diaphragm removable for inspection to provide permanent separation between the air and expanded fluid. The air in the tank shall be contained on the shell side with all expanded fluids being directed in to the bladder or diaphragm chamber. Entire unit shall be FDA approved for potable water systems.
- B. Expansion tanks serving water heaters with storage greater than 119 gallons and or with heat input of more than 200,000 BTU shall be ASME rated as required by the State Boiler Code.
- C. Thermal expansion tank sizing shall be as scheduled on the drawings and be per the manufacturer's recommendation:
- D. Provide thermal expansion tanks for each domestic water system where a check valve, or other backflow prevention devices, are installed on the cold water supply to the water heating equipment. Tanks shall be NSF or FDA approved.
- E. Acceptable manufacturers:
 - 1. Bell and Gossett "PT" series.
 - 2. Watts "DET" Series.
 - 3. Amtrol "Therm-X-Trol", or approved equals only

2.3 HOT WATER CIRCULATING PUMPS

- A. Provide centrifugal type in-line circulating pumps with associated controls to circulate the hot water in domestic hot water systems where indicated on the Drawings.

- B. Each pump shall be Inline Boosters with bronze impeller and bronze body, designed for installation in open systems.
- C. Furnish an Allen Bradley Bulletin 600 manual starter with thermal overload protection for the control of each pump motor and aquastat with adjustable set point for thermostatic control of pump.
- D. Furnish with each pump two ball type isolation valves, discharge check valve, thermometer and aquastat. Provide gauge taps and cocks at inlet and outlet of each pump for testing.
- E. Furnish each pump with an automatic timer switch capable of being set to turn off circulation pump. Provide fully automated seven-day programmable timer switch equal to Tork E100 Series, unless recirculating pumps are required to be controlled by the Building Management System.
- F. Capacities of each pump shall be as scheduled on the Drawings.
- G. The Aquastat shall be set at a temperature differential of -5 Deg. F. The return loop temperature shall be set to 5 degrees below the supply loop temperature. Shall be equal to Honeywell L4006A.
- H. Acceptable Manufacturers:
 - 1. Grundfos
 - 2. Bell and Gossett
 - 3. Taco.
 - 4. Armstrong.

2.4 THERMOSTAT MIXING VALVE

- A. TM-1: RADA 320-R, 3/4" inlet, 3/4" outlets (IPS) Thermostat Mixing Valves with polyethetic bimetal coil thermostat directly linked to valve porting, adjustable limit stop, color coded scale: Hot to Cold, wall support, inlet union angle strainer check stops, outlet volume control/shutoff, Inlet piping manifold with unions. Factory assembled and tested unit mounted exposed on wall. Mixing valve assembly shall be piped per manufacturer's recommendations. Coordinate with Architect for exact location. Armstrong Intl., RADA valve only, no exceptions.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install water heaters in accordance with manufacturer's recommendations. Install the relief valves so that the bulbs will be immersed in the tanks. Pipe relief valve outlet full size to the nearest floor drain, hub drain, or outside as required by Governing Authorities and Codes.
- B. Coordinate with other trades to provide equipment housekeeping pads as shown on the drawings and per Section 22 05 00.
- C. Coordinate with Structural Engineer for approved wall mounted or suspended platforms to support electric water heaters located above the floor. Submit equipment weights and proposed supports, brackets and platform framing to the Structural Engineer for review and approval prior to purchasing or fabricating platform.
- D. Furnish Operations and Maintenance Manuals, and written warranty, for each domestic water heating equipment and accessories as required in Division 01 specifications and Section 22 0500.

- E. Provide thermal expansion protection for all heating equipment as specified and required by heating equipment manufacturer's written warranty.
- F. All thermostatic mixing valves or other "anti-scalding" devices shall be concealed in walls and fully accessible for service, repair, or replacement through an adequately sized access door panel with a loose key lock.
- G. Domestic water heaters in excess of 119 gallons storage and/or heat input in excess of 200,000 BTU/Hr shall be installed to meet all location and clearance requirements as set forth in the Texas State Boiler Law, which includes, but is not limited to; a minimum horizontal clearance of two feet on all sides of the heater and a minimum vertical clearance of four feet from the top of the heater to the bottom of the roof joist or above floor structure.
- H. Coordinate with the Electrical Contractor for available voltage, phase and circuit breaker size required for the heater. Electrical requirements shall be verified prior to ordering equipment.
- I. Furnish and install heat traps on the supply and discharge piping for all domestic heating water systems not provided with recirculation system and/or water heating equipment with integral heat traps.
- J. Furnish and install relief valves on cold water inlet piping for all bottom feed water heaters. Valve shall comply with ANSI Z21.22.
- K. Refer to Division 23 00 00 for sheet metal and flue piping requirements. In line draft induces shall be provided as part of the flue piping system. Size and capacity of in line induces shall be based on actual equipment installed and field conditions.

END OF SECTION

SECTION 22 4200

PLUMBING FIXTURES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 01 - General Requirements and referenced documents.
- B. Comply with Division 22 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of the work.

1.2 SYSTEM DESCRIPTION

- A. Provide items of plumbing related equipment and accessories as indicated herein and as illustrated on the Drawings.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 70 00.
- B. Indicate on submittal construction materials, finishes, sizes, quantities and related hardware.
- C. Product Data:
 - 1. Plumbing fixtures.
 - 2. Carriers.
 - 3. Fixture trim.
- D. Certification: Submit certification that completed system complies with test requirements of municipality, State, and other public authorities having jurisdiction over system.
- E. Provide closeout documents as required in Division 1, Section 01 70 00.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in following order of precedence:
 - 1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
 - 2. Provisions specified in this Section.
 - 3. International Plumbing Code.

1.5 HANDLING

- A. Deliver fixtures crated and in undamaged condition.
- B. Replace damaged fixtures with new fixtures.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

NOTE: The following manufacturers are considered acceptable, however, products submitted in lieu of specified item shall be equivalent to specified item as determined by the Architect and Engineer.

- A. Standard Plumbing Fixtures:
 - 1. American Standard.

2. Kohler.
 3. Sloan
 4. Elkay.
 5. Just.
 6. Bradley.
 7. Acorn.
- B. Carriers (Extra-Heavy Carriers – Min. 1,000 lbs):
1. Jay R. Smith.
 2. Josam.
- C. Seats:
1. Church.
- D. Faucets:
1. T&S Brass.
 2. Chicago
- E. Flush Valves:
1. Sloan, Regal
- F. Lead-Free Stop Valve in Hot and Cold Supply Lines to Each Fixture:
1. McGuire.
 2. T&S Brass.
 3. Engineered Brass Company.
- G. Stainless Steel Sinks:
1. Elkay.
- H. Service Sinks:
1. Stern Williams.
- I. Electric Water Coolers:
1. Halsey-Taylor.
- J. Showers:
1. Bradley.
 2. Leonard

2.2 MATERIALS

- A. Fittings: Chrome plated heavy cast brass.
- B. Nipples: Extra heavy. Provide brass nipples or stainless steel nipples for domestic water systems including nipples at water heater & storage tank connection (no black steel nipples shall be allowed in domestic water systems).
- C. Plumbing Fixture Trim: Solid brass, including nuts and washers, handles, hold-down screws, valve bodies, swivel spouts, ferrules, sleeves, locknuts, and bushings.
- D. Piping Connections from Shutoff or Stop Valve to Fixture: Chrome plated brass pipe or chrome plated copper tubing.
- E. Floor and Wall Escutcheons: Chromium plated with set screws.
- F. Exposed Fixture Trimmings and Fittings: Chromium plated brass with polished, bright surfaces.

- G. Flush Valves: Non-hold open type, without seat bumpers.
- H. Traps: Chrome cast brass adjustable P-traps with cleanout.

2.3 DESIGN AND FABRICATION

- A. Plumbing fixture trims shall allow renewable operating units to be removed without detaching supply fitting or faucet.
- B. Fixtures, except water closets and urinals, shall have water supply above rim.
- C. Equip fixtures with supply discharge below rims with backflow preventers.
- D. Furnish angle stops, straight lock shield, loose-key pattern stops for supplies' and install with fixtures. Supplies shall be rigid, unless noted otherwise.
- E. Exposed traps and supply pipes for fixtures shall be connected to rough piping systems at wall.
- F. All plumbing trim and fixtures indicated on Drawings as handicap shall meet the current requirements of the Americans with Disabilities Act (ADA) and the Texas Accessibility Standards (TAS).
- G. Faucets, bubblers, & supply stops shall be National Sanitation Foundation (NSF) Standard 61, Section 9, compliant and listed for residential/drinking water use as required by the Federal Clean Water act effective January 1, 1997 in addition shall be Lead-Free per "Safe Drinking Water Act" U.S. Senate Bill S.3874.

2.4 PLUMBING FIXTURE SCHEDULE

WC-1 - WATER CLOSET - WALL HUNG-FLUSH VALVE:

1. Sloan ST-2459, wall hung siphon jet, elongated bowl, vitreous china with 1-1/2" top spud.
2. Flush valve: Sloan "Regal" 111-YBYC, 1.6 GPF, polished chrome, externally adjustable, diaphragm type with 1" screwdriver angle stop, metal oscillating handle with sweat solder adaptor kit and cast wall flange with set screw.
3. Seat: Church 9400-SSC (5321.112) solid plastic, white, elongated, open front seat, less cover, combination check and self-sustaining hinges with stainless steel posts.
4. Support: Jay R. Smith 0211 Series extra heavy duty, **minimum 1,000 lb.** combination closet carrier and fitting. Provide back-to-back and single installations as job requires.
5. Mounting height (for student or adult) as directed by Architect.

WC-2 - WATER CLOSET - WALL HUNG-FLUSH VALVE – ADULT HANDICAP:

1. Same as specified for WC-1 water closet, except mount in compliance with ADA/TAS for handicapped use of primary user (Adult).
2. Mounting height as directed by Architect.

UR-1 - URINAL - HANDICAP:

1. Sloan SU-1009, wall hung, siphon jet with raised dome strainer, vitreous china with 3/4" top spud, 14-1/2" elongated, flushing rim and 2" female outlet connection.
2. Flush valve: Sloan "Regal" 186-0.5-YBYC, 0.5 GPF, polished chrome, externally adjustable, diaphragm type, with 3/4" screwdriver angle stop, metal oscillating handle with sweat solder adaptor kit and cast wall flange with set screw.
3. Support: JR Smith 0636 Series floor mounted carrier with bearing plate
4. Mounting height as directed by Architect.

L-1 LAVATORY - WALL HUNG - HOT AND COLD WATER - ADULT:

1. Sloan SS-3865, 20" x 18" vitreous china, "D" shaped bowl, self draining deck with side and back splash, modified to comply with ADA front approach requirements, 8" faucet centers, punched for concealed arms.
5. Faucet/Strainer: T & S Brass B-2990-CR, cast brass valve body, 8" centers, metal lever vandal-resistant color coded chrome handles, quarter turn operating cartridge, ADA Compliant, vandalproof aerator with integral 2.2 GPM flow restrictor. Provide Chicago 327-XCP perforated grid drain and wheelchair offset tailpiece for ADA front approach access.
6. Supplies: McGuire chrome riser supplies with loose key angle stops and chrome escutcheon plate with set screw.
7. Trap: McGuire 1-1/4" x 1-1/2", 17 gauge, chrome cast brass P-trap with cleanout plug and chrome escutcheon plate with set screw.
8. Support: Josam 17100 Series floor mounted carrier with concealed arms.
9. Mounting height as directed by Architect

L-2 LAVATORY - WALL HUNG - HOT AND COLD WATER - ADULT - HANDICAP:

1. Sloan SS-3865, 20" x 18" vitreous china, "D" shaped bowl, self draining deck with side and back splash, modified to comply with ADA front approach requirements, 8" faucet centers, punched for concealed arms.
2. Faucet/Strainer: T & S Brass B-2990-CR, cast brass valve body, 8" centers, metal lever vandal-resistant color coded chrome handles, quarter turn operating cartridge, ADA Compliant, vandalproof aerator with integral 2.2 GPM flow restrictor. Provide Chicago 327-XCP perforated grid drain and wheelchair offset tailpiece for ADA front approach access.
3. Supplies: McGuire chrome riser supplies with loose key angle stops and chrome escutcheon plate with set screw.
4. Trap: McGuire 1-1/4" x 1-1/2", 17 gauge, chrome cast brass P-trap with cleanout plug and chrome escutcheon plate with set screw.
5. Support: Josam 17100 Series floor mounted carrier with concealed arms.
6. Insulate exposed water supplies and drain piping with ADA approved insulation kit, equal to Truebro "Lav-Guard" Kit No. 102 and 105.
7. Mounting height as directed by Architect.

L-3 LAVATORY - WALL HUNG – TEMPERED ONLY WATER-STUDENT/HANDICAP:

1. Sloan SS-3065, 22" x 20" vitreous china, "D" shaped bowl, self-draining deck, modified to comply with ADA front approach requirements, 4" faucet centers, punched for concealed arms.
2. Faucet/Strainer: T&S Brass B-0805-VR-VF05, cast brass valve body, 7" integral spout, 4" centers, mechanical metered vandal-resistant, ADA Compliant, vandalproof aerator with integral 0.5 GPM flow restrictor. Provide Chicago 327-XCP perforated grid drain and wheelchair offset tailpiece for ADA front approach access.
3. Supplies: McGuire chrome riser supplies with loose key angle stops and chrome escutcheon plate with set screw.
4. Trap: McGuire 1-1/4" x 1-1/2", 17 gauge, chrome cast brass P-trap with cleanout plug and chrome escutcheon plate with set screw.
5. Support: JR Smith 0700 Series floor mounted carrier with concealed arms.
6. Insulate exposed water supplies and drain piping with ADA approved insulation kit, equal to Truebro "Lav-Guard" Kit No. 102 and 105.
7. Mounting height as directed by Architect.

EWC-1 - ELECTRIC WATER COOLER WITH BOTTLE FILLER - HI/LO

1. Halsey-Taylor HTHB-HAC-G8BISS-WF, barrier-free, ADA Compliant wall hung electric water cooler with hermetically sealed air cooled condensing unit, self-closing anti-squirt flex-guard bubbler volume regulator with front and side push-bars and with bottle filler and filter. Cooler shall deliver 8.0 GPH of 50 Deg.F. water at 90 Deg.F. ambient and 80 Deg.F. inlet water. **Entire unit shall be all satin stainless steel finish**, upper basin, middle shroud, side panels and lower shroud. Furnish accessory apron when units are mounted on an exposed wall or necessary to provide the ADA mandatory underside clearance. Provide Owner with 12 pack filter replacement, 55898C-12PK.
2. Support: JR Smith 0830 Series floor mounted carrier.
3. Supplies: McGuire chrome riser supply with wheel handle stop and chrome escutcheon plate with set screw.
4. Trap: McGuire 1-1/4" x 1-1/2", 17 gauge, chrome cast brass P-trap with cleanout plug and chrome escutcheon plate with set screw.
5. Mounting height as directed by Architect.

S-1 - SINK - ADULT (ADA FRONT APPROACH) WITH DISPOSER:

1. Elkay LRAD-2521 "Luster Tone" 25" x 21 - 1/4" x 5 1/2" deep single compartment sink with 4 hole punch, self-rimming, 18 gauge, Type 302 stainless steel, sound deadened underside, faucet deck, 4-hole punch (2 holes for faucet and one hole each for vegetable spray and deck mounted brass chrome plated vacuum breaker). Provide hole cap for fourth hole where dishwasher is not provided. Two 3-1/2" drain openings off-center front-to-back, ADA compliant.
2. Faucet: T & S Brass B-2743 mixing faucet washerless ceramic valving metal blade handle, rigid spout with 2.2 GPM flow restrictor, aerator, and vegetable sprayer.
3. Tailpiece and Strainer: Elkay LK-35 chrome plated brass strainer drain, 1-1/2" o.d. chrome plated brass tailpiece with conical strainer basket and neoprene stopper.
4. Continuous Waste: McGuire 1-1/2", 17 gauge chrome plated brass tubing for double compartment sink with disposer.
5. Trap: McGuire 1-1/2" x 1-1/2", 17 gauge, adjustable, chrome plated, cast brass P-trap with cleanout plug and chrome escutcheon plate with set screw with connection for disposer.
6. Supplies: McGuire stainless steel braided flexible supplies with wheel handle angle stops with chrome escutcheon plate with set screw.
7. Brass chrome plated Vacuum Breaker: Shall be deck mounted and provided for dishwasher to discharge to the disposer, Sioux Chief Model 249.
8. Provide In-Sink-Erator, "Badger 1", 1/3 horsepower, 120 volt, single phase disposal and power cord kit.
9. Branch to connection 1/2" cold water with ball cock and union at ice maker connection.

MS-1 - MOP SINK:

1. Stern Williams "Corlow" SBC-1700 terrazzo 24 inch by 24 inch floor mounted basin with 12 inch high walls with 302 stainless steel cap cast integral on threshold. Drain shall be cast brass drain body with stainless steel strainer, flat head, and slotted machine screws included.
2. Faucet: T&S Brass B-0665-CR-BSTP-CR chrome plated, quarter-turn ceramic cartridge integral check stops, vacuum breaker, wall bracket pail hook, 3/4 inch hose thread, 8 inch center, arm handle and RCJ-KCP supply arm.
3. 5'-0" Hose with Hose Bracket: Stern-Williams T35.
4. Splash Catcher Panel of 20 Gauge, 304 Stainless Steel: Stern Williams BP.
5. Important: Float basin with wet mortar between slab and basin to distribute weight evenly and prevent cracking of basin. Refer to installation recommendations by manufacturer.

SH-1 - SHOWER – HANDICAP:

1. Shower: Leonard PAM -II-ST "Pressure Activated Mixer", 1/2" inlets, 1/2" outlet, concealed piping, bronze and stainless steel construction, control valve shall be adjustable high temperature limit stop, with built-in shut-off, color coded dial indicator, wall flange, exposed parts stainless steel or chrome plated, with angle check stops and copper tube connection, DL2 inline diverter with lever handle.
2. Hand Held Shower Head: Leonard 62001 fixed spray hand shower with non-positive shut-off, 24" chrome plated wall bar with adjustable mounting flange and adjustable height slide bracket, chrome plated brass swivel connector, 69" chrome hose with quick disconnect, chrome plated supply elbow with flange and inline vacuum breaker, flow rate 2.5 GPM. Fixed shower head, Sloan AC-11, self-cleaning universal ball joint, volume control, lever operated, brass construction, chrome plated arm and flange, 2.0 GPM flow rate.
3. Diverter Valve: Leonard D2L.
4. Factory installed check valves on both the hot and cold water supplies. The mixing valve shall be factory pre-set for 120 Deg.F. maximum temperature. Contractor shall adjust temperature setting to deliver a max. of 110 Deg. F.
5. Shower Basin and/or enclosure shall be specified in other Division of Architectural Specifications. Drain shall be stainless steel cast integral with basin, or equal to Floor Drain FD-1, as specified in Section 22 13 16.
6. All shower controls and heads shall be located per Architectural Drawings, and shall comply with ADA mounting height requirements. All piping in wall and shower head shall be rigidly secured.

ICB-1 - ICEMAKER BOX CONNECTION

1. Guy Gray Model SSMIB-6AB, 20 gauge stainless steel box, shock arrestor, and 1/2" quarter turn angle valve.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's printed instructions and drawings.
- B. Fasten fixtures secured to masonry walls or stud partitions with 1/4" brass toggle or through-bolts.
- C. Anchor inserts flush with finished wall and conceal when fixtures are mounted.
- D. Fixture Connections:
 1. Make connections between earthenware fixtures and flanges on soil pipe gas tight and watertight with closet-setting compound or with neoprene gasket and seal.
 2. Do not use natural rubber gaskets or putty for these connections.
 3. Bolts shall be not less than 1/4" diameter and shall be equipped with chromium plated nuts and washers.
 4. Set fixtures with outlet flanges required distance from floor or wall to make first class joint with gasket and fixture used.
- E. Refer to Architectural Drawings for all mounting heights and exact locations. Coordinate with General Contractor prior to starting any work, provide any additional supports, hangers, openings, etc. as required for a complete installation. Coordinate all clearances and locations with other trades as required.
- F. Provide stop valve in each hot and cold water supply line to each fixture.

3.2 KITCHEN EQUIPMENT; MILLWORK AND CASEWORK FIXTURES

- A. Furnish and install all sinks and other plumbing items shown on furniture, unless shown otherwise. Provide detailed information to the supplier of such furniture as to required cut-outs and drillings, so as to permit proper coordination during fabrication. Provide local shut-off valves in all supplied to such furniture. Provide all waste connections, including drains, p-traps and other materials, using sanitary materials corresponding to piping system material in each case.

3.3 FIXTURES FURNISHED UNDER THIS DIVISION

- A. Plumbing fixtures and equipment shall be set in place, leveled and connected as indicated on the drawings. Use china caps to conceal mounting bolts, and grout between all vitreous china fixtures and finished wall and floor surfaces with plaster of paris or portland cement.
- B. Install wall hung water closets, lavatories, urinals, sinks and electric water coolers on carriers.
- C. Do not install metal fittings until adjoining tile work has been acid- cleaned. The Mechanical Contractor shall be responsible for the proper protection of fixtures after installation.
- D. Connections to exposed plumbing fixtures shall be complete with chrome plated brass nipples, tubing, wall escutcheons, etc.

3.4 ADJUSTING AND CLEANING

- A. Prior to final acceptance of the work, Mechanical Contractor shall inspect all faucets, flush valves, stop valves, etc., to determine whether they operate properly and discharge proper quantities of water. Connect any deficiencies to satisfaction of Architect's representative.
- B. Thoroughly clean all plumbing fixtures, trim and accessories of all tape, adhesives and other foreign materials prior to final acceptance.

END OF SECTION

SECTION 23 0000

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) WORK

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. The work in this Division covers all HVAC work specified in all Division 23 Specification Sections and as illustrated on the HVAC Drawings. Comply with other Division 23 Specification Sections as applicable. Refer to other Divisions for coordination of work with other trades.
- B. Provide all labor, materials, equipment, transportation, tools and services, and perform all operations required for, and reasonably incidental to, the providing of mechanical system work described in this Division.
- C. Contractor shall include providing instructions and demonstrations of the operation of each installed system in its totality to the Owner. Refer to Division 23 specifications for specific Owner training requirements. As a minimum include training of the Owner's Operating Personnel on:
 - 1. Safety Shut-Down of HVAC Equipment.
 - 2. Sequence of HVAC Equipment Operation.
 - 3. Operation and Maintenance of all HVAC Equipment.
- D. The Conditions of the Contract, including the General Conditions and Supplementary Conditions, and Division 1 - General Requirements, apply to work covered by this section.
- E. Refer to Specifications Section 01 3300 for "Submittal Procedures".

1.2 RELATED DOCUMENTATION

- A. Section 01 6000: Product Requirements.
- B. Section 01 7700: Closeout Procedures.

1.3 DESCRIPTION OF HVAC DEMOLITION WORK

- A. Contractor shall remove several items of materials and equipment under this Section of the Specifications. Equipment and materials to be removed shall be as indicated and noted on the Drawings and as required to facilitate the new installations.
- B. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner's Representative.

PART 2 (NOT USED)

PART 3 EXECUTION

3.1 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to Substantial Completion, fully instruct the Owner in the operation, adjustment, and maintenance of products, equipment, and systems; including, but not limited to all HVAC equipment, related accessories and components, temperature controls and the energy management system. Owner shall operate all systems in cooperation with Contractor for a period of at least five (5) working days prior to, or shortly after, Substantial Completion.
- B. Arrange for services of qualified manufacturer's representatives to fully instruct Owner on specialized portions of installations, such as air handling units and auxiliaries; Automatic temperature controls.

- C. Arrange for each installer of equipment that requires regular maintenance to meet with Owner to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by trained manufacturer's representatives. Include detailed review of the following items:
 - 1. Operating and Maintenance Manuals.
 - 2. Record Documents.
 - 3. Spare Parts and Materials.
 - 4. Lubricants.
 - 5. Cleaning.
 - 6. Standard and Extended Warranties.
 - 7. Maintenance Requirements, Agreements, and similar continuing commitments.
- D. As a part of these instructions for operating equipment, demonstrate the following procedures:
 - 1. Start-Up.
 - 2. Shut-Down.
 - 3. General System Operating Instructions.
 - 4. Emergency Operating Conditions.
 - 5. Noise and Vibration Adjustments, where applicable.
 - 6. Safety Procedures.
 - 7. Economy and Efficiency Adjustments.
 - 8. Effective Energy Utilization.
- E. Return at first change of season for changeover from air conditioning to heating, or from heating to air conditioning, to demonstrate system operation in the opposite season.
- F. Submit a complete record of instructions as a part of maintenance instructions and the data book (Operations and Maintenance Manual) given to Owner. For each instructional period, supply the following data:
 - 1. Date of Instruction.
 - 2. System or Equipment Involved.
 - 3. Names of Persons Giving Instructions.
 - 4. Other Persons Present.
 - 5. Time Period (in hours/minutes) Instruction Provided.
- G. Amount of time to be devoted to instructional sessions shall be reasonable and consistent with the size and complexity of equipment and systems installed and as specified in other sections of these specifications.

3.2 TEMPORARY WORKING ACCESS

- A. Each respective trade shall remove existing piping, equipment, fixtures, and other items to provide access for work in existing facilities and on the site. Contractor shall seek Owner's Representative approval prior to removal of any equipment and mechanical appurtenances.
- B. Reinstall and refinish items removed, or otherwise damaged, to match existing adjacent surfaces, or new finishes where applicable, upon completion of the work.

3.3 DISRUPTION OF EXISTING FUNCTIONS

- A. Access: Access to and use of the existing facilities and site will be restricted, and shall be under the direction and control of the Owner.
- B. Disruptions: Maintain existing mechanical, and other existing systems, and maintain all existing functions in service except for those specific portions scheduled for disruption. Where existing functions to remain in use are disrupted, they shall be fully restored after disruption, in full compliance with this Division of the Specifications for new work, as quickly and as reasonably possible.

- C. Scheduling of Disruptions: Seek and obtain approval by the Owner two (2) weeks in advance of each event. Failure to schedule such disruptions in advance will result in the Contractor being stopped or rescheduled by the Owner without added cost to the Owner.
- D. Notice of Disruption: Date, time and duration of each disruption shall be subject to the Owner's prior written approval and shall include the following information in the form of a memorandum submitted by the Contractor to the Owner's Representative for approval by the Owner:

Facility/System	Date	Starting Time	Duration
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- E. Emergency Disruptions: When circumstances preclude obtaining advance approval as specified above; make request immediately on knowledge of the requirement, and perform the work so as to cause the minimum amount of disruption, for the minimum duration.
- F. Notification: Notify the Owner's Representative and the Owner immediately, by telephone and then in writing, as changes and additions to the scheduled disruption requirements become known
- G. Duration:
 1. Complete as large a portion of the work as possible before initiating disruption.
 2. Maintain adequate personnel, supplies, materials, equipment, tools, and other resources at job site to avoid unnecessary delay in resumption of normal services.
 3. Keep duration of disruption as short as possible.
 4. During the disruption, perform only the amount of work that requires the disruption, so as to minimize duration of disruption.

3.4 MODIFICATIONS AND RELOCATIONS

- A. Modify, remove, or relocate materials and items indicated on the Drawings or required by the installation of new facilities.
- B. Relocations:
 1. Repair and restore to good functional condition, equipment, materials and items scheduled for relocation, which are damaged during dismantling or reassembly operations.
 2. Remove carefully, in reverse order to original assembly or placement, items which are to be relocated.
 3. Protect items until relocation is complete.
 4. Clean and repair items to be relocated, and provide new materials, fittings, and appurtenances required to complete the relocations as required to restore them to good operating order.
- C. Perform the relocation work in accordance with applicable Sections of these Specifications, utilizing skilled workers.

3.5 SCHEDULE OF WORK

- A. Reference Division 1 for Additional Scheduling Information.
- B. Contractor and all system installers for each Section of these Specifications shall realize that the present building houses a completely functioning facility that must continue in full operation 12 hours per day during the school year. Outages of any kind cannot occur during the school year, except only when and as the Owner's Representative or Owner may direct otherwise. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use unless special permission is granted by the Owner.

- C. Work under the various specification sections must be expedited and close coordination will be required in executing this work. Various system installers shall perform their portion of the work at such times as directed so as to insure meeting scheduled dates, and to avoid delaying the work of other trades. Owner's Representative will verify scheduled times of work in the various areas involved, each system installer shall cooperate in establishing these times and locations and the system installers shall process their work so as to insure proper execution and completion.
- D. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to existing lines, services, or items of equipment in the present building or where existing equipment items or services in that building are to be replaced or modified in any way.
- E. Generally, modifications to, replacing of, or making new connections into existing service lines shall be accomplished only during the times directed by the Owner. New lines shall be installed and tested before connections are made into existing lines, meters, or services.
- F. All other modifications to existing piping systems and appurtenances, including necessary interconnections between old and new portions of the various systems, shall be accomplished at times scheduled so as not to interfere with the normal use of the building and the existing systems to which connection is to be made.
- G. The use of any type of fastening or hanging device which requires the use of shots or explosives of any nature shall not be used. Explosives shall also not be used for any excavation inside an existing building.
- H. Where required by conditions at the site, Contractor shall perform portions of work at night or at other such times as may be required to insure completion of work on schedule. No additional compensation to the Contractor will be paid for such work or required utilities.
- I. Contractor shall be available, as deemed necessary for job progress by the Owner, for weekly progress and coordination meetings with the Engineer, Engineer, and other Owner's Representatives, when required. These meetings shall be used to monitor progress of submittals, receipt of materials, construction progress, cooperation of trades, field coordination by the Contractor, and to resolve unforeseen conditions in an expeditious manner. Failure to attend meetings, to respond in a timely manner to requests for information, or to progress at an acceptable pace to maintain the construction schedule shall constitute a delay by the Contractor and may be cause for assessment of fees to the Contractor as outlined in Division 1.
- J. Provide all temporary connections as necessary to facilitate the phasing of construction, even where not specifically shown. Where temporary work is required it may be required that the Contractor produce a Shop Drawing or field sketch to illustrate the intended methods which shall be submitted for approval by the Engineer

3.6 SALVAGE, DEMOLITION, AND RELOCATION

- A. It shall be the responsibility of the Contractor to remove and store those items of existing equipment as indicated on the Drawings to be removed. All items of equipment or fixtures removed shall be protected from damage insofar as is practical.
- B. Mechanical items to be removed, salvaged, or relocated shall be removed by the respective trade who would normally be responsible to install new work similar to that to be removed. This shall include whatever selective demolition is necessary to avoid damaging other work of other trades. Each trade shall be responsible for their respective demolition. However, all trades shall keep informed as to the project schedule as it relates to the Demolition Scope of Work.
- C. These items shall be stored on site for a minimum of two (2) weeks unless indicated otherwise by the Owner's representative to allow for inspection by the Owner. Deliver, all items tagged to be

retained by the Owner to a designated storage location on site or to the Owner's designated Service Center or Warehouse. All items not retained by the Owner shall be removed from the site by the Contractor at no additional cost to the Owner.

- D. The attendant piping, ductwork, hangers, foundations, etc., of those items of existing equipment to be removed, shall also be removed in their entirety. No piping, hangers, etc., shall be abandoned in place. Where branch lines are removed, the branch shall be capped as close to the main as possible.
- E. Relocations:
 - 1. Repair and restore to good functional condition materials and items scheduled for relocation and/or reuse and which are damaged during dismantling or reassembly operations.
 - 2. New materials and items of like design and quality may be substituted for materials and items indicated to be relocated, in lieu of relocation, upon approval of shop drawings, product data and samples.
 - 3. Remove carefully, in reverse to original assembly or placement, items which are to be relocated.
 - 4. Protect items until relocation is complete.
 - 5. Clean and repair and provide new materials, fittings, and appurtenances required to complete the relocation and to restore to good operative order.
 - 6. Perform the relocation work in accordance with pertinent sections of the specifications, utilizing skilled workers.
 - 7. Refer to Drawings for specific requirements of temporary services and relocated equipment and fixtures.

3.7 CLEAN UP

- A. Remove all debris, rubbish, and materials resulting from cutting, demolition, or patching operations from the work area on a daily basis.
- B. Where such work generates dust and debris take all precautions necessary to prevent dust and debris from accumulating in or on other mechanical and electrical equipment. This may require adding temporary filter media over ventilation air openings of certain types of equipment. For all projects constructed in the City of Dallas, Texas, this requires all duct openings to be covered with plastic or sheet metal.
- C. At the conclusion of this work clean all building materials, mechanical equipment and electrical equipment so that all items are dust free and operating properly. Where dust causes damage to equipment the Contractor shall make repairs to this equipment at no cost to the Owner.
- D. Transport all demolished materials and equipment indicated above in approved containers and legally dispose of all debris off site in a manner approved by the Engineer and Owner.

END OF SECTION

SECTION 23 0500

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Conditions of the Contract including the General Conditions, Supplementary Conditions, and Division One, shall apply to work of this Division, whether attached or not.
- B. The requirements specified in this Section shall be applicable to work specified in other Sections within this Division.

1.2 SCOPE OF WORK

- A. All Division 23 sections of these specifications shall include all labor and material to complete the entire mechanical systems as specified and shown on the Drawings.
- B. All work shown and specified shall be completely installed and connected by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner and Owner's Representative.
- C. Provide all services and perform all operations required in connection with, or properly incidental to, the construction of complete and fully operating systems with all accessories as herein specified and shown on the Drawings.
- D. Refer to "Conditions of Work" in Division 1.

1.3 GENERAL

- A. The accompanying Drawings show diagrammatically the sizes and location of the various equipment items and the sizes of the major interconnecting piping and ductwork, without showing exact details as to elevations, offsets, control lines, and other installation details. The Contractor shall carefully lay out his work to conform to the site conditions, to avoid obstructions and provide proper grading of lines. Exact locations of outlets, apparatus, and connections thereto shall be determined by reference to the Drawings, reviewed Shop Drawings, including equipment drawings, and rough-in drawings, by measurements at the building, and in cooperation with work specified in other sections of these specifications. Minor relocations necessitated by the conditions at the site or directed by the Architect shall be made without any additional cost to the Owner.
- B. These specifications and the accompanying Drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. Contractor shall coordinate the proper fitting of all material and apparatus into the building and shall prepare larger scale installation drawings for all critical areas, areas with limited working clearances, and areas of significant congestion requiring a higher level of coordination illustrating the installation of work specified in Division 23 in relation to all other portions of work specified in other Sections of these Specifications. Interferences with other portions of work, or the building structure, shall be corrected before any work proceeds. Should changes become necessary on account of the failure of the Contractor to comply with these stipulations, Contractor shall make all necessary changes at no expense to the Owner.
- C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.

- D. It is the intent of the Contract Documents to provide an installation complete and operational in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section, or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems and required to complete the installation.
- E. Contractor sets forth that all personnel have the necessary technical training and ability; and that all work specified in this Division will be installed to the best standard of each trade, and will be complete and in good working order. If any of the requirements of the Drawings and specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, report same to the Architect promptly after discovery of the discrepancy.
- F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.4 EXAMINATION OF THE SITE

- A. Contractor shall visit the site, verify all items indicated on the Drawings or specified, and familiarize himself with the work conditions, hazards, grades, actual formations, soil conditions, points of connection, utility locations, and local requirements.
- B. Contractor shall take these conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.
- C. All site visits shall be coordinated and scheduled with the Owner.

1.5 CUTTING AND PATCHING

- A. Excessive cutting of the building structure, walls, floors, ceilings, roof, etc., will not be permitted. No structural member shall be notched or cut unless specifically shown on the Drawings, or unless such cutting is authorized by the Architect.
- B. Provide for all holes or openings of proper size and shape as may be necessary for the proper installation of work specified in Division 23, consulting with the Architect regarding proper locations and sizes.
- C. Where deemed necessary, and after consulting with the Architect, perform all cutting and patching required for the installation of piping, ductwork, etc. This shall include the cutting of concrete floors, concrete and tile floors, walls, ceilings, roofs, etc. It shall also include patching them as required to restore work to match existing finishes, following installation, testing, backfilling, insulation, etc.
- D. Holes through concrete shall be drilled with "Mole", "Core-It", or other diamond point hole saw.
- E. Refer to Section 01 7329, Cutting and Patching.

1.6 CODE REQUIREMENTS

- A. Contractor is required to comply with the requirements of all National, State, and local codes and utility companies having jurisdiction. In no case does this relieve the Contractor of the responsibility of complying with the requirements of these specifications and Drawings where specified conditions are of higher quality than the requirements of the above specified offices. Where requirements of the specifications and Drawings are below the requirements of the above offices having jurisdiction, the Contractor shall make installations in compliance with the requirements of the above offices and shall notify the Architect promptly.

- B. Contractor shall comply with the requirements and standards set forth by, but not limited to, the following:
 - 1. (NFPA) National Fire Protection Association.
 - 2. (OSHA) Occupational Safety and Health Administration.
 - 3. (NEC) National Electric Code.
 - 4. (IECC) International Energy Conservation Code.
 - 5. Local Plumbing Code.
 - 6. Local Building Code.
 - 7. Local Mechanical Code.
 - 8. Local Fire Code.
 - 9. Local Energy Code.
- C. Contractor shall obtain all permits, inspections, and approvals as required by all authorities having jurisdiction. Fees and costs incidental to these permits, inspections, and approvals must be assumed and paid by the Contractor.

1.7 RECORD DRAWINGS

- A. Contractor shall, during the execution of work, maintain a complete set of "Record Drawings" upon which all locations of equipment, ductwork, piping, and all deviations and changes in the work shall be neatly recorded for use in producing "As Builts" at Project Close- Out. This shall include the incorporation of all Supplemental Drawings issued during the Construction Period.
- B. All "Record Drawings" shall be reviewed monthly during the Construction Period, along with the monthly Pay Application Request.
- C. Refer to Section 01 7700, Closeout Procedures.

1.8 RECORDS AND INSTRUCTIONS FOR OWNER

- A. Accumulate during the job's progress the following sets, in triplicate, in accordance with the provisions of Section 01 7700, Closeout Procedures:
 - 1. Warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
 - 2. Equipment and fixture brochures, wiring diagrams, and control diagrams.
 - 3. Copies of reviewed Shop Drawings, and material and equipment submittals. Copies of rejected submittals and Shop Drawings are not to be provided.
 - 4. Operating instructions for heating and cooling and other mechanical systems. Operating instructions shall include recommended maintenance and seasonal change-over procedures.
 - 5. Other data and drawings required during construction.
 - 6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
 - 7. Valve tag charts and diagrams specified elsewhere herein.
 - 8. "As-Built" Record Drawings shall be provided in electronic format on a USB drive (provide two (2) copies) in a PDF or DWG format as determined by the Owner.
 - 9. Provide copies of all City Inspection Certificates of Approval.
 - 10. Provide Contractor's Certification Statement that all equipment furnished and all work performed is in compliance with all applicable codes referenced in these specifications, or those which are currently in effect.
- B. Provide not less than two (2) days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of all equipment.

- C. All of the above data should be submitted to the Architect for approval at such time as the Contractor asks for his last payment request, just prior to his final payment request. In no case will any portion of retainage be released until these documents are submitted and accepted.
- D. Refer to related portions of Division 1 for Project Close-Out requirements, Operation and Maintenance Data, Warranties, and other related certificates.

1.9 SHOP DRAWINGS AND SUBMITTALS

- A. Contractor shall submit to the Architect shop drawings, product submittals, and catalog data on all ductwork, equipment, and materials designated on the Drawings and specified herein. A minimum of one (1) electronic copy of each shall be submitted. Additional copies will be required when indicated by the Architect and as required for project coordination.
- B. Each submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgement of compliance does not relieve the Contractor from responsibilities for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all dimensions for proper fit of all parts of the work and performance of all equipment supplied to meet specification requirements are, and remain, specific responsibilities of the Contractor.
- C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary; and, should there be any charges in connection with this, they shall be borne by the Contractor.
- D. Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheets therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered and accessories as specified.
- E. Shop Drawings are not intended to cover detailed quantitative lists of heating specialties, valves, air distribution devices, fixtures, and similar items, as the Drawings and specifications illustrate those items; and it is the Contractor's responsibility to procure the proper quantities required to comply with the established requirements.
- F. Shop Drawings prepared to illustrate how equipment, piping, ducts, etc., can be fitted into available spaces will be examined under the assumption that the Contractor has verified the conditions shown. Review by the Architect shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Shop Drawings.
- G. Various material submissions of such items as air devices, plumbing fixtures, drains, and other related items or accessories shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets. Cover sheets for each item submitted shall have sufficient bare space to allow for shop drawing review stamps.
- H. Contractor shall process his submitted data to ensure that it conforms to the requirements of the Drawings and specifications, and there are no omissions and/or duplications.

- I. Shop Drawings and Submittals shall be accompanied by certification from the Contractor, and firm preparing such, that Shop Drawings have been checked for, and are in compliance with, the Contract Documents.
- J. All Submittals and Shop Drawings shall have been submitted for review by the Architect and Engineer within 90 days after Contract Award Date.

1.10 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

- A. Seal voids around ducts and pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Section 07 8400, Firestopping.

1.11 DRAWINGS

- A. Drawings show diagrammatically the locations of the various pipes, ductwork, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building, and in full cooperation with work specified in other Divisions of these specifications; and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.
- B. Should any changes be deemed necessary in items shown on the Contract Drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.
- C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention prior to bids being submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate the installation of any particular apparatus.
- D. Lay out all work maintaining all lines, grades, and dimensions according to these Drawings with due consideration for the work of others. Verify all dimensions at the site prior to any fabrication or installation. Should any conflict develop or installation be found impractical, the Architect shall be notified before any installation or fabrication, and the existing conditions shall be investigated and proper changes effected without any additional cost.
- E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of materials and work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.12 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

- A. Equipment supplied as portions of work specified under other Divisions of these specifications shall be furnished with proper roughing-in diagrams and shall be installed as a part of Division 23.
- B. Furnish materials and labor required for the connection of this equipment.
- C. Contractor shall ascertain that all equipment so specified is included as part of this work.

1.13 COOPERATION

- A. Coordinate all work indicated in Division 23 with work specified in other Divisions to assure proper and adequate interface with other portions of the work.
- B. Maintain contact and be familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed. Install the required systems in their several stages, at the proper time to expedite the work and avoid unnecessary delays in the progress of other portions of the work.
- C. Should any questions arise between work specified in Division 23 with respect to other portions of work specified in other Divisions of the Specifications, reference shall be made to the Architect for instructions.

1.14 MATERIALS AND EQUIPMENT

- A. All materials and equipment purchased shall be new. No used or reconditioned equipment will be allowed.
- B. Substitutions: Products of same functions, performance and design will only be considered if in full accordance with the requirements of Section 01 6000, Product Requirements. The products of other manufacturers will be acceptable; only if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency, maintainability, and dependability, the purpose for which the items specified were intended.
- C. Listed Manufacturers:
 - 1. Manufacturers listed in a product or system specification are those manufacturers considered capable of manufacturing products conforming to the specification requirements, and are listed therein to establish a standard.
 - 2. The "listing" of a manufacturer does not imply "acceptance" or "approval" of any standard product of that manufacturer.
 - 3. Products offered by listed manufacturers shall be equal to, or superior in all respects to, that specified by named products; and shall meet or exceed specification requirements.
 - 4. The description of specific qualities takes precedence over the reference standards and the description of qualities and reference standards together take precedence over the named product of listed manufacturers.
- D. Product Options:
 - 1. Products specified only by Reference Standards or by Description only means that any product meeting those standards or descriptions, by any manufacturer, will be considered.
 - 2. Products specified by naming several products or manufacturers means that only the manufacturers named will be considered.
 - 3. Products specified by naming only one product and manufacturer means that no option exists unless a substitution is accepted. Submit a request for substitution for any product or manufacturer not specifically named.
 - 4. Products specified by Description, Reference Standard, and naming several products or manufacturers means that any product and manufacturer named meeting those descriptions and standards will be considered. Submit a request for substitution for any product or manufacturer not specifically named.

E. Limitations or Substitutions:

1. During Bidding Period, Instructions to Bidders, in Division 1, will govern times for submitting requests for substitutions under requirements specified in this Section.
2. No later than ten (10) days prior to the bid date, Contractor shall notify the Architect in writing of any desired substitutions of products in place of those specified. These requests will be considered; and, if a favorable response is determined, this will be documented in the form of an Addenda.
3. Substitutions will not be considered when indicated or implied on Shop Drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
4. Substitute products shall not be ordered or installed without written acceptance.
5. Only one request for substitution for each product will be considered. If substitution is not accepted, Contractor shall provide specified product.
6. Architect will determine acceptability of any and all substitutions.

F. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior, as the Architect is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturer's engineering data, specification sheet, and a sample, if practical or if requested or specified. In no event shall a proposal for substitution be cause for delay of work. This shall include a detailed comparison to each product specification paragraph.

G. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

H. No substitutions will be considered contingent upon pending certification and rating agency approvals. Such certifications and ratings shall be in effect at the time of bidding.

1.15 EQUIPMENT SIZES AND REQUIREMENTS

A. Space allocations in machinery and mechanical equipment spaces are based on equipment scheduled in each case. Should the Contractor request a substitution for equipment of another make that requires more space in any critical dimension, the Contractor shall submit, together with other submittal data on the equipment, prints of drawings indicating how the equipment may be installed, indicating room for servicing and revisions in piping or ducting and any other details necessary for the Architect to form a judgment as to the suitability of the substitute material, as to performance, suitability for the space and other variables.

B. Duties of certain equipment items, horsepower of driving motors and electrical characteristics are scheduled for equipment items of a particular make in each case. Should requests for a substitute material be accepted which has other requirements that would involve allied equipment or other portions of work, the Contractor shall be responsible for all modifications required at no change in contract price. As example:

1. If an accepted A/C Unit has a brake horsepower requirement above the motor horsepower scheduled, the Contractor shall be responsible for providing a larger motor and heavier drive and any change in size of the protective device, conduit run and conductors serving that motor. The latter shall be extended through an individual branch protective device and branch circuit on through the panel, feeder, feeder protective device, etc.

- C. Structural steel members are indicated to provide supports for certain specific sizes and weights of equipment. Should a substitution request involve other equipment, the spacing of the supports shall be varied to suite the equipment. Should the weight or size of a proposed substituted item of equipment require additional supporting steel members, the Contractor shall include documentation of the additional supports in the request for substitution and install them at no change in contract price if the substitution is accepted.
- D. Various large apparatus to be installed may require that the apparatus be installed prior to the installation of portions of structural, walls, or door frames. Coordinate the installation of these items to ensure that no demolition of general construction is necessary for equipment installation or that the apparatus does not have to be disassembled for installation.

1.16 STORAGE AND PROTECTION OF MATERIALS

- A. Store and protect materials and equipment as specified in Section 01 6600, Product Storage and Protection.
- B. Contractor shall provide storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, and as directed by the Architect. In no case, shall storage interfere with traffic conditions in any public or project thoroughfare.
- C. All work and material shall be protected at all times. Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all mechanical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.
- D. On site storage shall not be inside the building during construction progress, but shall be in approved trailers or as specifically approved otherwise by the Architect. Storage inside the building shall only be allowed when so allowed by the Architect.

1.17 FOUNDATIONS

- A. Provide equipment foundations associated with the work specified in Division 23.
- B. All top corners and edges of all foundations shall be neatly chamfered at a one inch (1") high 45 degree angle.
- C. Foundation bolts shall be placed in the forms when the concrete is poured. Allow one inch (1") below the equipment bases for alignment, leveling, and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary.
- D. After removal of the forms, the surface of the foundation shall be rubbed until smooth.
- E. Unless otherwise noted, foundations shall be four inches (4") thick air handling units and other mechanical equipment, unless specifically noted otherwise on the Drawings.
- F. All concrete work shall conform to the requirements of Section 03 3000, Cast-in-Place Concrete.
- G. Provide housekeeping pads and foundations for every item of floor mounted equipment specified in Division 23 specifications. Pads shall extend a minimum of two inches (2") in each direction beyond the equipment size.

1.18 EXCAVATION AND BACKFILLING

- A. Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground conduits shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the piping and refilled to grade as specified. After the piping has been installed and reviewed by Architect and local building authorities, trenches shall be backfilled to grade with approved materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by Architect shall be a part of this contract.
- B. Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet (5') in depth, Contractor shall pay a qualified engineer to prepare detailed Drawings and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project contract Documents.
- C. Where granular bedding backfill is used (includes gravel and sand) provide concrete cut-off collars of clay plugs where ever utility lines cross building lines to prevent water from traveling in the trench backfill and entering beneath the structure.
- D. Refer to soils testing report for recommendations on backfill material, compacting instructions and criteria for materials to be used.

1.19 WIRING

- A. Unless otherwise noted, all wiring for motors, starters, and equipment is specified in Division 26.
- B. Wiring of temperature controls shall be performed in accordance with the requirements of Division 26 but shall be performed as outlined in other sections of these specifications.
- C. All power for control circuits required for the Temperature Control System shall be provided and installed where indicated on the Division 26 Drawings, but shall otherwise be provided as indicated in other sections of these specifications.
- D. Each supplier of equipment requiring control shall have wiring diagrams furnished with submittals. This shall be used to determine conduit layouts required to complete the electrical portions of the instrumentation and control systems.
- E. All motors furnished as a portion of work specified in Division 23 shall be wired as specified in Division 26.
- F. Except where combination starter-disconnects are specified elsewhere herein or in Division 16, all motors shall be provided with safety disconnect switches in accordance with the National Electrical Code as specified in Division 26.
- G. Furnish all necessary wiring diagrams for equipment specified in Division 23, as a part of equipment submittals, for installation under other sections of these specifications.

1.20 EQUIPMENT STANDARDS

- A. All basic materials and equipment shall be standard catalog products of a reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year.
- B. First of a kind new technology devices will not be considered.
- C. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic materials or equipment shall carry the guarantee of the basic material or equipment manufacturer and repair and replacement parts shall be available through normal trade channels locally.

1.21 DEHUMIDIFICATION OF BUILDING

- A. It shall be the Contractor's responsibility to properly and thoroughly dry out all building materials used for construction of the building, as well as to dry out the building and dehumidify the spaces prior to activating the HVAC System. Extra precautions should be taken by the Contractor not to allow excessive humidity to develop in the building prior to final connection and activation of the HVAC System. Should it become necessary, the Contractor shall procure the required equipment (multiple portable dehumidifiers, as required to include temporary power thereto) to properly dry and dehumidify the building materials and spaces so as not to force the HVAC System to perform beyond its intended abilities.
- B. Contractor shall be responsible for all costs in connection with repair and/or activation to the building and its HVAC Systems should excess moisture cause damage thereto.
- C. Contractor shall provide proof of dehumidification by furnishing temperature and humidity readings for each section of the building as measured and recorded by an independent agent approved by the Owner/Architect. Provide these readings to the Owner's representative prior to the building HVAC system being activated and also furnish with the Project Close-Out documents.
- D. The inside building Dew Point shall not exceed 55 Deg.F. for a period of 24 consecutive hours or for a total of 24 hours in a 7 day time period.

1.22 CLEAN UP

- A. Contractor shall be responsible for cleaning up after and during all work performed under this Division of the Specifications.
- B. Contractor shall, on a daily basis, remove construction trash and debris accumulation to minimize the entrance of dust, dirt, and debris in piping, ductwork, and mechanical equipment.
- C. At the completion of construction, just prior to Substantial Completion and sustained operation of equipment, thoroughly clean the inside of piping, ductwork, and equipment.
- D. Refer to Division 1.

1.23 FINAL CONSTRUCTION REVIEW

- A. Schedule: Upon completion of the work specified in Division 23, there shall be a final construction review of the completed mechanical systems installations. Prior to this walk-thru, all work specified in this Division shall have been completed, tested, adjusted, and balanced in its final operating condition and the preliminary test report shall have been submitted to and approved by the Architect.

- B. Personnel: A qualified person representing the Contractor must be present at this final construction review to demonstrate the system and prove the performance of the equipment.
- C. Building mechanical systems shall have been in operation for a minimum of 15 days and Test and Balance work shall be substantially complete prior to this review.
- D. Exceptions to the aforementioned requirements will be considered on a case-by-case basis dependent on the size and type of project, as well as construction schedule limitations.

1.24 CERTIFICATIONS

- A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.
- B. Provide copies of all applicable approved notices and inspection certifications from the various inspections conducted by the Local Code Enforcement Authorities.

1.25 GUARANTEE

- A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance, Substantial Completion, or as defined by Extended Warranty Contracts. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance.
- B. The Contractor shall also guarantee that the performance of all equipment furnished and installed under this Division of the Specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Owner's Representative may direct to demonstrate that the equipment installed meets the specifications and is delivering the capacity specified or called for on the Drawings.
- C. If there is any indication that the equipment does not meet the specified quantities, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to employ recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

END OF SECTION

SECTION 23 0513

COMMON MOTOR REQUIREMENTS FOR HVAC

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide motors for all mechanical equipment furnished under Division 23, as indicated herein and as illustrated on the Contract Drawings.
- B. All motors shall be of the same manufacture for like pieces of equipment; i.e., air handling units shall have motors of the same manufacturer. Pumps shall have motors of the same manufacturer, but both types of equipment are not required to have the same motor manufacturer.
- C. The following equipment with 3 phase 1 horsepower motors or larger shall be provided with NEMA Premium efficiency motors as specified herein:
 - 1. Split DX AC units.
 - 2. Fans.
- D. Three phase, horizontal, NEMA frame induction motors served by AC Adjustable Frequency Motor Controllers shall be designed to meet the intent of NEMA MG1, Part 31, Section 31.40.4.2 regarding voltage spikes without exception.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 3300 and 23 0500.
- B. Indicate on submittal the motors proposed for each system of equipment to be installed. This shall be in tabular form in one location for each type of equipment submitted. The lack of this information will be grounds for rejection of equipment submittals.
- C. Product Data shall be furnished which shall include:
 - 1. Motor Manufacturer.
 - 2. Motor Type; Open Drip Proof, Totally Enclosed (Fan Cooled or Air Over).
 - 3. Model of Manufacturer.
 - 4. Motor Horsepower.
 - 5. Motor RPM.
 - 6. NEMA Motor Efficiency at 25%, 50%, 75%, and 100% of Full Load Rating for motors served by variable frequency drives; 100% only for constant speed motors 1 HP and larger.
 - 7. Power Factor at 25%, 50%, 75%, and 100% of Full Load Rating for motors served by variable frequency drives; 100% only for constant speed motors 1 HP and larger.
 - 8. Service Factor.
- D. Certification: Provide manufacturer's literature indicating NEMA premium motor efficiency as tested in accordance with IEEE Standard 112, Test Method B. Provide

documentation to verify motors served by variable frequency drives meet NEMA MG1, Part 30 for 6-step drives and Part 31 for PWM drives.

- E. Provide closeout documents as required in Division 1.

1.4 QUALITY ASSURANCE

- A. Comply with all regulatory requirements in the following order of precedence:
- B. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
- C. Provisions specified in this Section of Specifications.
- D. Applicable provisions of standards of National Electric Code (NEC).
- E. Manufacturer shall have been manufacturing the motors as described herein for a minimum of ten (10) years.

PART 2 PRODUCTS

2.1 ELECTRICAL MOTORS, GENERAL

- A. All motors furnished under any of the several sections of these specifications shall be of a recognized manufacturer, be of adequate capacity for the loads involved, and wound for the electrical characteristics indicated on the Drawings and specified herein. Verify all job site voltages and power source available before submitting, ordering and installing any motor or related controls.
- B. Motors shall conform to the standards of manufacture and performance of the National Electrical Manufacturer's Association (NEMA) as shown in their latest publication.
- C. Motors shall be furnished with an open-frame, unless otherwise noted, or required by the NEC for the service conditions encountered. Motors exposed to weather shall be the totally enclosed type suitable for installation in ambient conditions for exposure to the sun, heat, and rain. Provide explosion proof motors where indicated and as required for the hazard in which to be installed.
- D. Unless otherwise noted, fractional motors rated at 1/2 horsepower and less shall be single phase, the motors rated at larger than 1/2 horsepower shall be three phase. Single phase motors shall be arranged for across-the-line starting.
- E. Single phase motors shall be capacitor start, induction run type, and shall be furnished with motor controller with pilot light where scheduled or indicated. Refer to Section 23 05 14.
- F. All motors shall be of the same manufacturer on similar equipment furnished by the same manufacturer, unless they are an integral part of the piece of equipment to which they are attached, such as a chiller. Air Handling Units shall have motors of the same manufacture and pumps shall have motors of the same manufacture; but, pumps and air handling units are not required to have motors of the same manufacturer.
- G. Three phase motors shall generally have the following characteristics:
 - 1. All copper windings.
 - 2. Type K, NEMA Design "B".
 - 3. Normal Starting Torque.
 - 4. Class B insulation.
 - 5. Continuous Duty Rated.
 - 6. 40 Deg.C. ambient rated.

7. Minimum 1.15 Service factor on motors 1 horsepower and larger; 1.25 service factor on motors 3/4 horsepower and smaller.
 8. 1800 RPM unless scheduled otherwise.
 9. Oversize steel conduit boxes.
 10. Greasable bearings.
 11. Stainless steel or aluminum motor nameplates for standard motor information.
 12. Cold rolled steel 1045 shaft.
 13. Steel frame and splash cover.
- H. Where other sections of specifications do not call for premium efficiency motors this section shall apply to motor requirements. Where premium efficiency motors are required in the other Sections of these Specifications refer to Article 2.2 herein.
- I. Motor manufacturers shall be Reliance, Baldor, General Electric, A.O. Smith or U.S. Motors. Other manufacturers will not be considered.

2.2 PREMIUM EFFICIENCY ELECTRICAL MOTORS

- A. All premium efficiency electrical motors furnished under any of the several sections of these specifications shall be of a recognized manufacturer, be of adequate capacity for the loads involved, and wound for the electrical characteristics indicated on the Drawings and specified herein. Verify all job site voltages and power source available before submitting, ordering and installing any motor or related controls.
- B. Motors shall conform to the standards of manufacture and performance of the National Electrical Manufacturer's Association (NEMA) as shown in their latest publication.
- C. Motors shall be furnished with an open-frame, unless otherwise noted, or required by the NEC for the service conditions encountered. Motors exposed to weather shall be the totally enclosed type suitable for installation in ambient conditions for exposure to the sun, heat, and rain. Provide explosion proof motors where indicated and as required for the hazard in which to be installed.
- D. All NEMA Premium efficiency motors shall be three phase.
- E. Except as otherwise specified NEMA Premium efficiency motors shall be drip-proof, squirrel cage, premium efficiency type as manufactured by A. O. Smith (E Plus III), Baldor (Super E), Reliance (Duty Master XE), General Electric (Energy Saver), or U.S. Motors Premium Efficiency NEMA Design B, induction type rated for constant duty with 40 Deg.C. ambient temperature rise. The motors shall have the following characteristics:
1. 1800 RPM unless scheduled otherwise.
 2. 1.15 Service Factor.
 3. Rigid base.
 4. Serialized and certified.
 5. Stainless steel nameplate.
 6. Class B insulated.
 7. 60 Hertz.
 8. High power factor.
 9. Ball Bearings.
- F. Totally enclosed motors and motors served by variable frequency drives shall be Class F insulated.
- G. Minimum Nominal motor efficiencies at 1800 RPM, 208 V, refer to drawings, 4 pole, full-load, per IEEE Standard 112, test method B, as defined by NEMA MG1-12.53, a and b, shall be as follows, along with minimum power factor:

MOTOR HP	NOMINAL EFFICIENCY		POWER FACTOR	
	TEFC	ODP	TEFC	ODP
1	85.5	85.5	84.0	84.0
1.5	86.5	86.5	85.7	85.7
2	86.5	86.5	85.7	85.7
3	89.5	89.5	85.5	85.5
5	90.2	89.5	88.0	88.0
7.5	91.0	91.0	82.0	82.0
10	91.7	91.7	82.0	82.0
15	92.4	93.0	86.0	83.5
20	93.0	93.0	86.5	84.5
25	93.0	93.6	87.5	87.0
30	93.6	94.1	88.5	87.0

- H. Furnish submittal data on all NEMA Premium efficiency motors furnished to include motor efficiencies as rated in accordance with IEEE Standard 112, Test Method B.
- I. All motors shall be of the same manufacturer on similar equipment furnished by the same manufacturer, unless they are an integral part of the piece of equipment to which they are attached, such as a chiller. Air Handling Units shall have motors of the same manufacture' and pumps shall have motors of the same manufacture; but, pumps and air handling units are not required to have motors of the same manufacturer.
- J. Each variable torque motor served by a variable frequency drive shall be capable of operating over a 10:1 speed range.
- K. Each premium efficiency motor shall be warranted for a minimum of three (3) years.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Motors shall typically be furnished by the manufacturer of the equipment which the motor will serve.
- B. Motors shall be factory installed in the equipment and be mounted on equipment bases, wired to a terminal box, connected to the mechanical device to be rotated, and factory run tested.
- C. When project schedules will not allow the above due to excessive lead time requirements, the Contractor shall do one of the following all at no additional cost:
 - 1. Locally procure the specified motors, while meeting all of the above requirements, and field install the motors on the equipment in accordance with the manufacturer's installation instructions.
 - 2. Accept factory installed standard efficiency motors and replace with high efficiency motors as noted above.
- D. Motors disconnects will be furnished and installed under Division 26, unless integral with, or specified to be a part of, the equipment as indicated elsewhere in other sections of these Specifications. The wiring to the motor and installation of the motor controller, if not specified to be integral with the equipment, as furnished under other sections of these specifications, shall also be installed under Division 26.

- E. Interlock and control voltage wiring shall be installed as outlined in other Sections of these Specifications.

END OF SECTION

SECTION 23 0514

COMMON MOTOR STARTER REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other trades, as required.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete system of motor starters as indicated herein and as illustrated on the contract Drawings.
- B. Provide other devices as indicated for control of motors and interface with automation or control systems, and as further required by the local authorities having jurisdiction.

1.3 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 23 0500.
- B. Indicate on submittal the starter type proposed to be used for each system and for the various sizes of motors required to be installed. This shall be in tabular form with attached cut sheets.
- C. Product Data:
 - 1. Snap Action Manual Motor Starters.
 - 2. Magnetic Across-the-Line Motor Starters.
 - 3. Control Transformers.
 - 4. Hand-Off-Automatic Switches.
 - 5. Pilot Lights.
 - 6. Number and Type of Auxiliary Contacts.
 - 7. NEMA Enclosure Type.
 - 8. Power and Control Wiring Diagrams.
- D. Provide closeout documents as required in Division 1 at Substantial Completion.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements in following order of precedence:
 - 1. Codes, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction over installation, inspection, and testing, including local codes.
 - 2. Provisions specified in this Section.
 - 3. Applicable provisions and standards of the National Electric Code (NEC).
- B. Manufacturer shall have been manufacturing the product proposed to be used as described herein for a minimum of ten (10) years; or it shall essentially duplicate a product line that has been manufactured for that length of time.
- C. Source Quality Control:
 - 1. Manufacturer's tests to meet applicable Underwriters' Laboratories, Inc., Standards.

2. Equipment designed and manufactured to meet applicable ANSI, NEMA, and IEEE Standards.

PART 2 PRODUCTS

2.1 MOTOR STARTERS

- A. Except as specified otherwise, a starter providing overload protection shall be furnished with each motor provided in Division 23, under this section of the specifications, unless:
 1. Starters are supplied as an integral part of the specified piece of equipment, such as chillers or boilers; or
 2. Starters are provided as specified for a variable frequency motor controller, or
 3. Starters are provided in Division 26 as part of a motor control center, or
 4. Starters are furnished under Division 26 as a combination motor starter-disconnect. Disconnects on fractional horsepower motors are not substitutes for a motor controller (starter). However, a motor controller on these size motors may substitute for a disconnect only where the required location for both is in the same location.
 5. Unit heater and ceiling fan fractional horsepower motors, 1/8 HP or smaller, with inherent thermal overload protection are not required to have motor starters.
- B. Each starter furnished herein shall have a NEMA horsepower capacity rating within the required limits of the motor which it serves.
- C. Unless otherwise indicated, starters mounted indoors shall be furnished with NEMA Type 1 enclosures, and those exposed to the weather shall be furnished with NEMA Type 3 enclosures.
- D. Each three-phase starter shall be provided with three thermal overload protection relays, one in each phase, be of the full voltage, across-the-line, non-reversing, single or two-speed, magnetic controller type. Overload relays shall be reset from outside the starter enclosure by means of an insulated bar or button.
- E. Starters shall have auxiliary contacts as required to comply with provision for electrical interlocks as defined hereinafter. Provide a minimum of one (1) normally open (N.O.) and one (1) normally closed (N.C.) auxiliary contacts with each three (3) phase starter. Where used, the secondary side of the control transformer shall be grounded and the other side shall be fused. Where starters are interlocked, the starter holding coils shall be of one voltage. Where starter line voltages are different and above 120 volts to ground, provide control voltage transformers in the starters that are interlocked. The control systems installer shall supply all electrical power supply and transformers as needed to serve control circuit requirements for temperature controls. Control voltage in each starter shall be not more than 120 volts to ground, with an individual control transformer provided in each interlocked starter. Control safety circuits shall de-energize the respective motors served via holding coils in the respective starter.
- F. Manual starters for fractional horsepower single phase motors shall be on-off, or snap action switch type combined with thermal overload device. The switch shall be so constructed that it cannot be held closed under a sustained motor overload. This shall be equal to an Allen Bradley No. 600-TAX216, toggle switch with neon pilot light and NEMA 1 enclosure unless indicated otherwise for severe duty.
- G. Provide starter covers with Hand-Off-Auto Switch and pilot light where equipment is interlocked or remotely controlled. Provide starter covers with Start-Stop buttons and neon pilot lights where equipment is locally controlled.

- H. The Hand-Off-Auto Switches shall be so wired that, when in automatic position, the control of their motors is transferred to the control system as outlined elsewhere herein; and, when in hand position, they themselves assume control of their motors irrespective of the remainder of the equipment, although the temperature control sequences shall operate the same while in either the "Hand" or "Auto" position. Safety devices will not be bypassed when in "Hand" position.
- I. Coordinate the purchase of all starting equipment, insofar as practical, such that all starting equipment on the project shall be of the same manufacturer.
- J. Starters shall be a regularly manufactured product to meet the intent of all requirements specified herein.
- K. Acceptable starters and controllers shall be manufactured by
 - 1. Allen-Bradley.
 - 2. General Electric.
 - 3. Square D.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All starters furnished under this section of the Specifications shall be installed under Division 26 of the specifications.
- B. Securely mount all starters level against walls where shown to be fully accessible and convenient for use. Where not specifically shown locate in a convenient and fully accessible location in a Mechanical Room, Electrical Room, Janitor Closet, Storage Room or above accessible lay-in ceiling when no higher than six inches (6") above the finished ceiling height and mounted to a wall or physically secure and stable surface.
- C. Where no wall exists for installation, furnish a unistrut fabricated stand secured to the floor, or other suitable structure. Use corrosion resistant fasteners.
- D. Where motor starters are ganged together, mount, insofar as is practical, all at the same distance from the floor, or other referenced point, to the bottom of the starters.
- E. Refer to manufacturer's wiring diagrams for proper wiring procedures.
- F. Wire all safety devices in series to be active in both the "Hand" and "Auto" position.
- G. Coordinate starter type and size with motor manufacturer's data for equipment actually installed.
- H. Field verify correct sizes of replaceable thermal overload elements for each motor actually installed. Do not over or under size elements.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

- A. A complete system of vibration isolation for all mechanical equipment subject to the transmission of noise and vibration to the building.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality and have been manufactured by a firm with a minimum of five (5) years of experience in this field.
- B. All equipment and materials shall be installed in a workmanlike manner by experienced mechanics and as recommended by the equipment and vibration isolation manufacturers.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions for all vibration isolation equipment.
- B. Shop Drawings: Submit in accordance with Section 23 0500.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall be rejected.
- B. Storage and protection of materials shall be in accordance with Section 23 0500.
- C. Install materials and equipment at the proper time to keep pace with the general construction and the work of other trades involved so as not to delay the project completion schedule.

PART 2 PRODUCTS

2.1 GENERAL

- A. Objectionable vibration or noise created in any part of the building by the operation of any equipment furnished and/or installed under Division 23 will not be permissible.
- B. Contractor shall take all precautions against the same by isolating the various items of equipment, pipes, and ducts from the building structure and by such other means as may be necessary to eliminate the transmission of excessive vibration and objectionable noise produced by any equipment installed thereby.
- C. Design all foundations, supports, etc., for equipment, piping and ductwork with this end in view.

- D. Contractor shall supervise and instruct the construction of all foundations and supports, in order that they may be constructed in such manner as to prevent the transmission of noise and vibration.

2.2 APPLICATIONS

- A. Isolating material shall be selected in each case in accordance with the manufacturer's recommendations and the latter shall be prepared to demonstrate, upon request of the Architect, the isolation effectiveness of the material which has been installed upon his recommendation.
- B. Isolators shall be so selected that when all the items in each of the mechanical rooms are in simultaneous operation, the vibration transmission to the building at the lowest disturbing frequency shall be limited to a maximum of 10% for a mechanical equipment room floor that is on the ground and 5% for all other building surfaces, including those in fan rooms, from all the equipment when the various items are in harmony.
- C. Isolators for supporting floor mounted equipment (where not internally isolated) shall be vibration isolation pads placed under the entire unit, plenum, and accessories so that there is no metal-to-concrete contact. Additionally, provide waffle style neoprene isolation pads beneath all floor mounted air handling units to include plenum and duct sections supported from the floor. Resilient pads may be either elastomeric, rubber-like, or compressed fiberglass with water resistant outer wrapping. Pads may be ribbed or waffled, and may vary in thickness from 1/4" to 1-1/2". Alternating layers of pads and steel shims will be allowed where an increased thickness or deflection is needed. Pads shall be sized to operate within the loading range of the manufacturer in pounds per square inch, and be loaded in the upper half of this range.
- D. Isolators for supporting Split DX A/C Heat Pump Units suspended from the construction above on rod hangers, not internally isolated, shall be of the open spring type with housings and noise washers, lock washers, nuts, etc. Isolators shall be similar to Amber Booth type BSW-1 or 2 or KDXW-1 or 2 with a minimum 1 inch deflection for fans and 2 inch deflection for air handling units. For fans and heat pump units less than 1000 CFM in capacity they may be isolated with rubber-in-shear isolating grommets in lieu of spring isolators.
- E. Condensing units or other equipment to be installed on housekeeping pads shall be mounted on ribbed neoprene pads equal to Amber Booth Ampad Type NR or NRC, Style B isolators.
- F. For all curb mounted fans, roof top units, and condensing units use two inch (2") wide x 3/8" thick neoprene isolation strips to be in continuous contact at all curb to equipment contact areas.

2.3 MANUFACTURER

- A. Isolating material used shall be equivalent to Amber-Booth, Peabody, Korfund Vibration Mountings, or Mason.

PART 3 EXECUTION

3.1 PERFORMANCE OF ISOLATORS

- A. Comply with recommendations set forth by the American Society of Heating, Refrigerating and Air Conditioning Engineers for the selection and application of vibration isolation materials and units.

- B. Comply with manufacturer's recommendations for selection and application of vibration isolation materials and units.
- C. Place isolators where indicated and where specified herein. Coordinate all isolator selections with approved equipment and other pertinent shop drawings of exact equipment to be isolated. Verify to ensure accuracy of load points and take into account any accessory devices adding to equipment loads to be supported by isolators.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC DUCTWORK, EQUIPMENT AND PIPING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other portions of the work.

1.2 SYSTEM DESCRIPTION

- A. Provide a complete system of piping Identification as specified herein for each of the systems as described herein.
- B. Provide a complete system of equipment identification tags as described herein.

1.3 QUALITY ASSURANCE

- A. The installation of all mechanical system identification devices shall be performed under this Section of the Specifications using materials which are the product of reputable manufacturers. The application of the materials shall be in strict accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.
- B. Manufactured Piping Identification markers, equipment name plates and valve tags shall be a product of Seton Name Plate Corporation, EMED Company, Inc., or Craftmark Identification to meet all ANSI Standards pertaining thereto.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions in accordance with Section 23 0500.
- B. Shop Drawings:
 - 1. Submit a list of all piping systems to be identified, color of background to be used, legend or wording to be displayed for each system, and the intended location of all markers to be displayed.
 - 2. Submit a list of equipment to receive identification tags, cut sheets and proof copies of tags which indicate location of tag and wording to be engraved thereon.
 - 3. Submit a list of valves with location, indicate type of service, type of tag, tag number and proposed valve tag chart as specified herein.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Storage and protection of materials shall be in accordance with Section 23 0500.

PART 2 PRODUCTS

2.1 PIPING IDENTIFICATION SYSTEM

- A. Furnish piping identification markers for all insulated and uninsulated piping systems in sizes and colors in accordance with ANSI Standard A13.1. Markers shall be as manufactured by Seton Name Plate Corporation similar to their vinyl plastic "Setmark" pipe markers with flow arrows. For systems with overall outside diameters under 6" use the snap-around markers. For systems with overall diameters 6" and over use strap-around markers attached with nylon ties.
- B. Markers shall be provided as a minimum for the following systems:
 - 1. Drains (Green background), for all insulated drains not contained in one space or roof; i.e., an A/C condensate drain in a fan room shall not require identification, whereas, as drain extending to another space would. Provide separate markers for condensate and auxiliary drain lines.
 - 2. Refrigerant Suction (Yellow background)
 - 3. Refrigerant Liquid (Yellow background)
- C. Refer to Section 09 9100 for color code paint requirements for all exposed mechanical equipment and piping.

2.2 EQUIPMENT IDENTIFICATION

- A. This Contractor shall provide identification plates similar and equal to Seton Name Plates, Style 2060.
- B. Name plates shall be a minimum of 1/16" thick and 1" X 3" in size with beveled edges. The surface shall be a black satin with a white core for lettering. Each plate shall be drilled with two mounting holes sized for 3/8" No. 3 round head nickel plated steel screws. Lettering shall be a minimum of 3/16" high. Lettering shall be cut through the black surface to the white core. Only name plates equal to those specified will be considered. No punched plastic tape or engraved aluminum plates are acceptable. Stick-on only plates are not acceptable.
- C. Provide and install identification plates on the cover of all starters or disconnects or combination starter-disconnects, where not mounted directly on the equipment, delivered by the mechanical system installer to the electrical systems installer and on each piece of Mechanical Equipment to include but not necessarily limited to:
 - 1. Exhaust Air Fans
 - 2. Unit Heaters (Electric)
 - 3. Split DX A/C Units
 - 4. Condensing Units
- D. Name plates shall have complete words describing equipment type, use and service. As an example, heat pumps shall be designated "HP-XX-Band Hall" to designate the equipment as a heat pump, number of heat pumps and area served. Use multiple or larger name plates as required to fulfill this requirement. Actual room names and numbers to be used for equipment tags and not architectural room names and numbers.

PART 3 EXECUTION

3.1 PIPE MARKER INSTALLATION

- A. Provide flow arrows at each marker location.

- B. Markers shall be spaced not more than 30 feet on center and at each change of direction but not more than 4 feet in each direction from each elbow and tee. Markers not required on piping runouts less than four feet (4') in length and 1-1/4" or smaller in size.
- C. Identification markers shall be installed on all new piping; indoors, outdoors and in the crawl space except for drain and waste lines 3/4" and smaller.
- D. Install markers on exposed piping systems only after jacketing systems and finish paint coats are complete. Refer to Sections 09 9100 and 23 0700.

3.2 IDENTIFICATION TAG INSTALLATION

- A. Secure tags level and in a conspicuous location with adhesive on equipment starters or combination starter disconnects and on the equipment where starters are not immediately adjacent to the equipment served.
- B. Additionally, secure all tags with screw fasteners after secured with adhesive.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING (TAB) FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. This Section shall be related to the General Provisions of the contract, including General and supplementary conditions.
- B. Refer to Section 23 0500 for General Provisions.

1.2 SCOPE OF WORK

- A. The work included in this Section consists of the furnishing of all labor, instruments, tools and services required in connection with the Testing, Adjusting and Balancing (TAB) of the Heating, Ventilating and Air Conditioning (HVAC) systems as described in the mechanical specifications and shown on the mechanical Drawings, or reasonably implied therefrom, to include the overall commissioning of systems and subsystems such as verification of operation of each control device and all equipment sequences of operation.
- B. TAB of the HVAC systems will be performed by an impartial Technical Firm who is a member of the Associated Air Balance Council (AABC) and whose operations are limited only to the field of professional TAB work. Owner shall select the TAB firm at an early stage of the project and notify the Contractor of TAB firm that shall be employed. TAB services shall be paid for directly by Owner. TAB firm to submit proposal to Owner at same time main proposal is due.
- C. TAB Firm is responsible to and shall submit all reports directly to the Engineer and as requested to the Owner.
- D. TAB services shall result in the optimum temperature, humidity, airflow, ventilation rates, and noise levels in the conditioned spaces of the building.
- E. The following basic components of the HVAC systems shall be tested, adjusted and balanced:
 - 1. Air distribution systems.
 - 2. Air moving equipment.
 - 3. Cooling systems.
 - 4. Heating systems.
 - 5. Control systems verification to include end devices, control sequences of operation and energy management system control and monitoring point verification.
- F. Document Review
 - 1. The TAB Firm shall be responsible for reviewing the HVAC Drawings and specifications relating to the TAB services for proper arrangement and adequate provisions of devices for testing, adjusting and balancing.
 - 2. TAB Firm shall review HVAC manufacturer's submittal data relative to balance capabilities.
 - 3. TAB Firm shall review submitted HVAC automatic temperature control sequences for conformity to the specifications.
- G. Three (3) hard bound copies and three (3) .pdf file copies saved onto Compact Disks of final report shall be submitted to the owner, or representative thereof, indicating a

summary of actual operating data and any abnormal operating conditions. The report will contain all required information as described within this specification.

1.3 SERVICES OF CONTRACTOR

- A. Contractor shall start up and test all materials and equipment which normally require testing. All piping, ductwork, etc., shall be tested to meet code requirements or the specification requirements, whichever is the more stringent. All equipment shall operate a sufficient length of time at the Contractor's expense to prove to the Architect, Engineer, and Owner that the equipment is free from mechanical defects, runs smoothly and quietly and performs satisfactorily to meet the requirements set forth in the Mechanical Drawings and Specifications.
- B. In order that all HVAC systems can be properly tested, adjusted and balanced, the Contractor shall operate the HVAC systems at his expense for the length of time necessary to properly verify their completion and readiness for TAB, and shall further operate and pay all costs of operation during the TAB period. Operating expenses to be paid for by the Contractor (not TAB firm) will include, but not necessarily be limited to, the following:
 - 1. Utility costs; electrical, water, gas, etc., as applicable.
 - 2. Personnel costs to start, operate and stop all HVAC equipment.
 - 3. All start-up labor and materials costs.
 - 4. All maintenance costs.
- C. The drawings and specifications have indicated valves, dampers and miscellaneous adjustment devices for the purpose of testing, adjusting and balancing the HVAC systems to obtain optimum operating conditions. It will be the responsibility of the Contractor to install these devices in a manner that will leave them fully accessible and readily adjustable to include access to allow recording of all motor and fan nameplate data. The TAB firm shall be consulted if there is a questionable arrangement of a control or adjustable device. Should any such device not be readily accessible, the Contractor shall provide access as required by the TAB firm.
- D. Contractor shall provide and coordinate the services of qualified, responsible sub-contractors, suppliers, and personnel as required to correct, repair or replace any and all deficient items or conditions found before and during the TAB period.
- E. As a part of this Project Contract, the Contractor shall make any changes in the sheaves, belts, motors, dampers and valves, or the addition of dampers and valves as required, to correctly balance the HVAC systems as required by the TAB firm at no additional cost.
- F. Provide sufficient time in Project Contract completion schedule to permit the completion of TAB services prior to Owner occupancy of the project.
- G. Contractor shall furnish without charge to the TAB Firm:
 - 1. One set of mechanical specifications.
 - 2. All pertinent change orders and Addenda.
 - 3. Two complete sets of mechanical plans with latest revisions.
 - 4. "As-installed" drawings.
 - 5. Approved control diagrams.
 - 6. Approved manufacturer's submittals for all HVAC equipment.
- H. Have all HVAC systems complete and in operational readiness prior to notifying the TAB Firm that the project is ready for TAB services. Certify in writing to the Architect, Engineer, and Owner that such a condition exists. Complete operational readiness prior to commencement of TAB Services shall include the following:

1. Construction status of building shall permit the closing of doors and windows, ceilings installed, etc., to permit the obtaining of projected actual operating conditions.
2. Air Distribution Systems:
 - a. Verify installation for conformity to design of all supply, return and exhaust ducts. Document and certify that all duct leakage tests as required by the mechanical specifications have been performed and the test results are within specified limits (provide copies of leakage test results). TAB firm shall be notified of the time when all leakage tests are to be conducted to allow them to witness as needed.
 - b. Verify that all volume dampers, smoke dampers and fire dampers are properly located, functional and open; verify that properly located, sized, and labeled access doors are installed in ducts and in general construction (ceilings, walls, furrings, etc.).
 - 1) Contractor shall manually release the fire, smoke or fire-smoke damper which shall be witnessed by the TAB firm or local municipality representative; to observe the full opening and closing of the dampers. Document these witness tests in writing.
 - 2) Contractor shall open or reset fusible links on these dampers, as required.
 - 3) Contractor shall furnish tags at each damper for recording the date, time and individual who last verified the operation of each damper.
 - c. Verify that minimum outside air, and relief air dampers provide tight closure, open fully and operate smoothly and freely (split DX AC and heat pump units directly connected to outside air only).
 - d. Verify that all supply, return, exhaust and transfer air diffusers, grilles and registers are installed as indicated on the mechanical Drawings.
 - e. Verify that all split DX AC units and associated apparatus such as heating coils, cooling coils, filter sections, access doors, etc., have been blanked and sealed to eliminate the bypass of air around the coils, filters, etc. or leakage of air into or out of the unit.
 - f. Install clean filters at each air handling unit or filter grille, and maintain these filters for the complete period that the subject system is being tested, adjusted, and balanced. Refer to Section 23 3000.
 - g. Verify that all (supply and exhaust) fans are operational including proper fan rotation, operates free from vibrations, belts are properly aligned, and belt tension is proper.
 - h. Verify that all motor starter overload heater elements are of proper size and rating; nameplate amperage to be within the range of the heater element size.
 - i. Make a record of actual motor amperage and voltage, per phase, and verify that they do not exceed nameplate ratings.
 - j. Verify specified vibration isolation accessories are correctly installed and adjusted.
 - k. Ensure that all fan drive components, motors, belts, sheaves, and fan wheels are all accessible to allow for servicing and verification of name plate data, sizes, and model and serial numbers, as applicable.

I. Automatic Controls:

1. Verify that all control components are installed in accordance with project requirements and are functional as intended by these specifications, including

- all electrical interlocks, damper sequences, air temperature resets, duct smoke detectors, high limit pressure sensors, freezestats, safeties, etc.
2. Verify that all controlling instruments are calibrated and set for designed operating conditions with the exception of room thermostats which shall be calibrated at the completion of TAB services with cooperation between TAB Firm and controls system installer.
 3. Automatic temperature control and/or energy management system installer shall thoroughly check all controls, sensors operators, sequences of operation, etc. before notifying the TAB agency that the automatic temperature controls and energy management system are operational. Automatic temperature control and/or energy management system installer shall provide technical support (technicians and necessary hardware and software) to the TAB agency to allow for a complete check out of these systems.
 4. The scope of the TAB work as defined herein is indicated in order that the contractor will be apprised of his responsibility regarding the coordination and assistance required to complete the project requirements for final TAB. The TAB Firm will be responsible to the Architect, Engineer, and Owner for the satisfactory execution of the TAB services.

1.4 SERVICES OF THE TAB FIRM

A. TAB Firm Qualifications:

1. TAB Firm shall be one which is organized to provide independent professional testing, adjusting and balancing services. The firm shall have one (1) Professional Engineer licensed in the State of Texas, with current registration.
2. TAB Firm shall have operated a minimum of ten (10) years, under its current firm name.
3. All personnel used on the job site shall be either TAB engineers or TAB technicians, who shall have been permanent, full-time employees of the Firm for a minimum of one (1) year prior to working on this specific project.
4. TAB Firm shall submit the following to the Architect/Engineer and/or Owner for approval prior to commencing services:
 - a. Name and biographical data of the Professional Engineer and all personnel to be assigned to this project.
 - b. Proof of company operation for a minimum of ten (10) years.

B. TAB Firm Responsibilities:

1. Liaison: The TAB personnel on the job shall act as liaison between the Architect, Engineer, Owner and Contractor.
2. Inspect the installation of mechanical piping systems, sheet metal work, temperature controls and other component parts of the HVAC systems during the early construction stages, and at other appropriate stages, for the purpose of reviewing that part of the work relating to proper arrangement and adequate provisions for TAB.
3. When performing inspection services prepare a punch list to be copied to the Architect, Engineer and Contractor noting observed deficiencies that would prevent adequate access to equipment and components installed or missing that would prevent the TAB Services from being carried out successfully.

C. TAB Firm Services:

1. TAB personnel shall, upon completion of the installation and start-up of the mechanical equipment systems, test, adjust and balance the HVAC systems to

- provide optimum temperature, airflow and noise conditions in the conditioned spaces in the building while the HVAC equipment is operating efficiently.
2. The Firm shall be responsible for testing, adjusting, balancing and logging actual data on all air distribution and air moving equipment, water distribution and water circulating equipment, fans, pumps, heating and cooling equipment and the operating conditions of all motors, etc. as indicated in this specification.

a. Air Distribution Devices:

- 1) Preset all volume dampers in the 100% open position.
- 2) Determine and verify proper air pattern deflection devices have been installed.
- 3) Verify size and types of all air devices installed, versus, the sizes and types indicated on the Drawings.
- 4) Read out all air distribution devices served by their source (Split DX A/C Unit, Supply Fan, Exhaust Fan, etc.)
- 5) Balance all air distribution devices proportional to design CFM.
- 6) Adjust source to design CFM.
- 7) Verify that all air distribution devices are within plus or minus 10% of design (and all proportional to one another on each system).

b. Exhaust Fans:

- 1) Verify correct fan rotation.
- 2) If belt driven, verify proper belt tension and that fan and motor sheaves are properly aligned.
- 3) Verify that all safeties and interlocks are operational.
- 4) Verify correct size and rating of motor overload protection.
- 5) Verify fan motor is not overloaded; amperage readings do not exceed nameplate rating, for each phase, as applicable.
- 6) Determine total air quantities of system served by the respective fan. Air quantities to be determined by duct traverse if duct configuration permits and air velocity is 1000 feet per minute or greater.
- 7) If air volume is less than design and motor capacity is available, adjust fan to design CFM. If new sheave or sheaves and belts are required, data will be submitted to Contractor.
- 8) Balance air distribution system (see Air Distribution Devices).

c. Fire, Fire-Smoke, and Smoke Dampers:

- 1) Verify operation of all fire-smoke and smoke dampers only by witnessing the Contractor fully opening and closing these dampers.
- 2) Verify each fire, fire-smoke, and smoke damper is located where indicated on the Drawings and tagged or identified with a permanent fire-resistant tag or stencil (at access door location).
- 3) Verify that each fire, fire-smoke, and smoke damper is provided with a suitably sized and located access door to allow full testing and observation of damper operation. Verify each duct access damper has suitable access through general construction features.
- 4) Witness the Contractor testing each fire-smoke and smoke damper which shall be manually released, allowed to fully close, verifying it has a tight fit when closed, and then verify it does not bind when opening or closing.
- 5) Witness each fire-smoke and smoke damper being fully opened by the Contractor and the fusible links on the fire damper portion of

fire-smoke dampers being reset by the Contractor to include other related devices on smoke-fire dampers.

- 6) Verify that all fire dampers are fully opened.
- 7) Identify all dampers requiring repair or having a faulty installation.
- 8) Write down pertinent information on damper testing tags to verify dates tested and initials of tester to confirm a successful test was conducted.

d. Split Direct Expansion Air Conditioning Units:

- 1) Verify that the outside, return and relief air dampers are operational and move freely.
- 2) Verify that filters are clean at the time of testing.
- 3) Verify correct evaporator and return or relief air (as applicable) fan rotation.
- 4) If belt driven, verify proper belt tension and that fan and motor sheaves are properly aligned. If direct drive, verify that motor is multi-speed motor and adjust speed setting for air balance purposes.
- 5) Verify that all equipment safeties are operational, as applicable, (low and high pressure limit switches, freestat, high static pressure, anti-recycle timer, etc.)
- 6) Verify correct size and rating of motor overload protection for each supply, return and relief fan motor.
- 7) Verify each fan motor above is not overloaded; amperage readings do not exceed motor nameplate rating.
- 8) Determine total supply and return air. Air quantities to be determined by duct traverse if duct configuration permits and air velocity is 800-1000 feet per minute or greater.
- 9) Balance air distribution system (see Air Distribution Devices).
- 10) If air volume is less than design and motor capacity is available, adjust fan or fans, to obtain supply and return design CFM quantities to within $\pm 10\%$ of design. If new sheave or sheaves and belts are required, data will be submitted to Contractor for change out. For direct drive fans, adjust fan speed setting. After adjustments are made, retest units to determine final air balance quantities.
- 11) If applicable, determine the required static pressure and submit the static pressure control set point to control contractor for setting. Final set point shall not be arbitrary, but shall be based on the minimum value to obtain design air flows at 100% operation.
- 12) Test and adjust the minimum outside air up to any maximum values scheduled, for demand controlled ventilation, and return air CFM relationship to design.
- 13) Verify all temperature control devices are set and calibrated at design set points.

3. During the balancing process, all abnormalities or malfunctions of equipment or components discovered by the TAB personnel, will be reported promptly to the Architect, Engineer, Owner and Contractor so that the condition can be corrected expediently.

4. The temperature controls will be verified for calibration and proper relationship between control devices. The Contractor will be advised of any instruments out of calibration so that the Automatic Temperature Controls (ATC) contractor can recalibrate, using data supplied by the TAB Firm as required.

5. Thoroughly test the Energy Management System (EMS), as applicable. The testing of the Energy Management System shall include all HVAC controls, sensors, operators, sequences, etc. The tests shall include verification that commands introduced at the EMS console actually occur and temperatures, pressures, etc. indicated at the EMS console correlate with the actual reading at the sensing point. The ATC and EMS contractor shall provide technical support to the TAB Firm for a complete check out of the HVAC temperature controls and the Energy Management System. The EMS workstation console and field direct digital control panel displays of measured variables such as temperature, relative humidity, and pressure shall have the displayed values offset through software to be within 0.3 Deg.F. of the temperature, 5.0 percent for relative humidity, 25 parts per million (PPM) for carbon dioxide, and 0.01% for pressure of the actual variables measured in the field, with recently calibrated test equipment, at the sensor locations.
6. After testing, adjusting and balancing to the design conditions, if comfort conditions are not being maintained, the air conditioning system shall be rebalanced within the limitations of the equipment installed to obtain comfort conditions. If comfort conditions cannot be obtained, a report will be submitted giving specific data regarding the trouble area.
7. Make not less than three (3) inspections within ninety (90) days after occupancy of the building, and make adjustments if required, to insure that satisfactory conditions are being maintained throughout. Inspections are to be coordinated with Architect, Engineer, and Owner; and shall be documented with a supplemental report containing data and information, as required, after each visit, to document in writing that such visit took place and to note any unusual operating conditions.
8. Make an inspection during the opposite season from that in which the initial adjustments were made and at that time make any necessary modifications to the initial adjustments required to produce optimum operation of the systemic components to produce the proper conditions in each conditioned space. The opposite season inspection shall be coordinated with the Architect/Engineer and Owner. This inspection shall be documented with a supplemental report containing any pertinent data and information regarding readings and adjustments made.

1.5 TAB REPORT

- A. TAB report shall incorporate all performance data for the HVAC systems. The intent of the final report is to provide a reference of actual operating conditions for the Owner's operating personnel.
- B. All measurements and recorded readings (of air, water, electricity, etc.) that appear in the report must be made on site by the permanently employed technicians or engineers of the TAB Firm.
- C. TAB report shall include but not be limited to the following:
 1. Index.
 2. Preface: A general discussion of the system, an outline of normal and ventilation modes of operation, any unusual operating conditions and any deficiencies not corrected as of the time the report was written.
 3. Instrumentation List: A list of instruments used by type, model, range and calibration date. All instruments must be calibrated within six (6) months prior to the starting date of TAB services.
 4. Air Distribution Devices (Supply, Exhaust, Return, and Relief Air type where Balance Dampers are Used):

- a. Manufacturer, model and size.
 - b. Location.
 - c. Design and actual CFM (cooling and heating).
 - d. Air distribution devices, where a velocity indicating instrument is used to determine CFM; provide the required and actual velocity in FPM (when an air flow hood is used to determine CFM, only CFM is required to be recorded.)
5. Exhaust Fans:
- a. Manufacturer, model and size.
 - b. Design and actual CFM.
 - c. Design and actual fan RPM.
 - d. Design and actual static pressure (leaving minus entering).
 - e. Motor nameplate data.
 - f. Motor starter data and motor overload protection (heater) sizes and rating.
 - g. Actual motor amperage and voltage (all phases).
6. Fire, Fire-Smoke, Smoke Dampers:
- a. Fill out a tag (provided by the Contractor) at each damper with a set of the tester's initials and the date that the damper was tested and operation verified, as witnessed by the TAB firm, as being acceptable.
 - b. Tags shall have additional spaces for future testing/verification.
7. Cooling/Heating Coils and Heat Exchangers:
- a. Manufacturer.
 - b. Design and actual CFM.
 - c. Design and actual entering and leaving static pressures.
 - d. Design and actual entering air temperatures.
 - e. Design and actual leaving air temperatures.
 - f. Actual outside air temperature during testing.
 - g. Design and actual entering water temperature.
 - h. Design and actual leaving water temperature.
 - i. Design and actual coil pressure drop.
 - j. Design and actual GPM.
8. Split System Indoor Units:
- a. Manufacturer, Model, Size, and Serial Number.
 - b. Design and actual CFM (supply, return, and outside air).
 - c. Design and actual evaporator motor RPM.
 - d. Static pressure entering and leaving filters, coils, furnaces, and fans.
 - e. Evaporator motor name plate data.
 - f. Evaporator motor starter data and motor overload protection size and rating, or setting, for adjustable devices.
 - g. Actual evaporator motor amperage and voltage (all phases).
 - h. Filter: type, thickness, sizes, quantities of each size, and condition (new, clean, dirty, loaded, wet, etc.).
9. Condensing Units:
- a. Manufacturer, Model, Size and Serial Number.
 - b. Location.
 - c. Actual unit name plate data.
 - d. Actual unit (compressor and condenser unit motors) amperage and voltage, all phases.

1) Ambient temperature entering condenser.

- D. Instructions to Operating Personnel: TAB Firm shall instruct the operating personnel regarding the following:
1. Systems Operation.
 2. Unusual Operating Conditions
 3. System Troubleshooting Procedures.
- E. Guarantee: Provide extended warranty of twelve (12) months after occupancy during which time the Architect/Engineer and/or Owner may, at his discretion, request check of the balance of any HVAC equipment. Provide TAB technicians to assist as required in making such tests. When any device is found not balanced in accordance with the mechanical plans and specifications, that HVAC system shall be completely rebalanced as directed by the Architect/Engineer and/or Owner at the TAB Firm's expense.

END OF SECTION

SECTION 23 0700

INSULATION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

- A. Provide the systems of insulation which are specified for the control of heat transfer, sound control, and prevention of condensation.
- B. Provide protective devices to prevent compression abrasion or puncture of the piping insulation systems installed to include inserts, pipe shields, PVC jacketing and aluminum jacketing as specified herein.
- C. Provide piping identification systems as specified in Section 23 0553, Mechanical Systems Identification for HVAC ductwork, equipment and piping.

1.3 QUALITY ASSURANCE

- A. The installation of all thermal insulation shall be performed by a single firm regularly engaged in the insulation business, using skilled insulation mechanics and using insulation materials which are the product of reputable manufacturers. The application of the materials by the insulator shall be in accordance with the published standards of the manufacturer of the materials, using any special materials as required by these specifications and by those published standards.
- B. Materials shall be manufactured by Schuller, Pittsburg Plate Glass, Owens-Corning, Foster, Childers, Certainteed, Johns Manville, or Knauf.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions to allow review of Materials and Methods to ensure complete compliance with specifications.
- B. Shop Drawings: Submit materials to be used and method of application for each system in tabular form. General statements not specifically identifying means or methods to be used shall be cause for rejection. Include descriptive data and cut sheets on each type of insulation material, sealing method, adhesives used, insert types, shield sizes, and PVC or aluminum jacketing as specified.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Promptly replace all damaged, deteriorated or wet insulation materials.
- C. Storage and protection of materials shall be in accordance with Section 23 0500.

PART 2 PRODUCTS

2.1 PIPING AND EQUIPMENT INSULATION MATERIALS

- A. Interior Domestic Cold Water Lines: Refer to Division 22.
- B. Domestic Hot Water and Hot Water Return Lines: Refer to Division 22.
- C. Waste, Drain and Miscellaneous Lines:
 - 1. The drain from each piece of Air Handling Equipment condensate drain pan and all refrigerant suction piping shall be insulated with foamed plastic, Armacell Armaflex or Aeroflex Aerocell slipped on while the piping is being fabricated, and with all joints, butt type, sealed using an adhesive recommended by the manufacturer of the plastic. The insulation shall be continuous from the drain opening in the Air Handling equipment condensate pan to the point of discharge with an open sight air gap over a drain. All formed plastic insulation shall meet ASTM E-84 requirements. Provide 1/ 2" thick insulation on condensate drains and 1-1/2" thick insulation on refrigerant suction piping. Insulate all refrigerant piping external to the building. For all "Armaflex" type insulation installed outdoors, not covered by aluminum jacketing, apply two (2) coats of NOMACO K-Flex R-374, or Foster 30-64, or approved equal, protective coating (ultra-violet rays), white in color.
 - 2. The body of each floor drain and all primary and overflow roof drain bodies, where the body of the drain is out of the ground, or above a ceiling: Refer to Division 22.
 - 3. Waste lines serving electric water coolers and floor drains (includes P-traps) receiving cold condensate from air handling equipment condensate pans to the point where they join the nearest vertical waste stack or sanitary main, all horizontal and vertical primary storm drainage piping to the point of penetration to the underfloor and the first vertical piece of the overflow drain pipe (below the drain body) and the first horizontal section of overflow drain piping to the first three feet (3') of vertical pipe beyond that section: Refer to Division 22.
- D. Plenum Safe Jacketing:
 - 1. Where non-plenum rated piping (such as PVC, CPVC, FRP, PE, PP, ABS, PVDF, etc.) is installed in return air plenums cover all exposed portions of this piping with a plenum safe jacketing, or wrap, system that is a factory manufactured and tested non-combustible barrier, to flame and smoke spread, designed to encapsulate non-rated or combustible items located in return air plenums, in accordance with the most recent additions of the International Building and Mechanical Codes.
 - 2. Plenum safe jacketing shall be covered with a light weight fiberglass reinforced foil scrim finished high temperature rated insulation with an approximate density of 6 pounds per cubic foot. Jacketing shall have a Flame Spread and Smoke Developed rating of 0 for the unfaced blanket and be under 25 and 50 respectively for these items as tested in accordance with U.L. 723 and ASTM E-84. Maximum Flame Spread in accordance with U.L.1887 shall be 0 feet. Maximum smoke/optical density and Average Smoke per U.L.1887 testing shall not exceed 01 and 0 respectively. U.L. 1887 test procedure is a modified tunnel test which provides test data for flame spread and smoke density using a single plastic pipe and a bundle of plastic pipes of various sizes subjected to a fire test.
 - 3. Thermal resistance of the barrier system shall be 4.2 as tested in accordance with ASTM C518. The Barrier System shall be able to withstand an operating

temperature up to 2,300 Deg. F. and have a melting point of no lower than 3,100 Deg. F.

4. Plenum safe jacketing shall be a minimum 1/2 inch thick and have at least one side covered with a foil skin which must face the outer, or exposed, side. All joints in each direction shall be overlapped a minimum of one inch (1"). Jacket shall be secured tightly around the piping with either stainless steel banding or stainless steel tie wire. Use stainless steel crimp clamps on banding fasteners. Tie wires shall be secured using twist tensioning. Seal all cut edges with aluminum foil tape to ensure there is no exposed fiber.
5. Plenum safe jacketing shall be as manufactured by:
 - a. Great Lakes Textiles, Inc. or approved equals by;
 - b. 3M Corporation.
 - c. Thermal Ceramics.
 - d. FyreWrap by Unifrax

E. Refrigerant Lines Exposed to the Outdoors:

1. Insulate as described in A.1 above for all refrigerant lines.
2. Cover with a 0.016 inch thick aluminum with locked seams and banded joints made watertight. Jacketing shall be equivalent to Childers Aluminum roll jacketing conforming to ASTM B-209, with smooth mill finish.
3. Cover mechanical couplings and fittings with prefabricated aluminum jacketed fitting covers with factory applied moisture barriers to thickness to match that on piping and band in place. Fitting covers shall be equivalent to Childers ELL-JACS., Tee-Jacs, Flange-JACS, and Valve-JACS. Seal ends to prevent moisture penetration and to make completely weatherproof.

2.2 DUCTWORK INSULATION MATERIALS

A. Duct Insulation - External:

1. Concealed (above ceilings) external duct insulation shall be glass fiber blanket-type insulation of not less than 1 lb. per cu. ft. density with a factory applied flame-retardant vapor barrier facing. Facing shall consist of a layer of aluminum foil, reinforced layer of glass fibers, and a layer of kraft paper all bonded together with fire-retardant and adhesive. Insulation, adhesives, and tapes shall be rated in accordance with U.L. 181A or 181B. Minimum duct wrap insulation thickness shall be two (2") inches thick and be equal to Certainteed Type IV duct wrap.
2. All insulation systems shall meet the requirements of the most recent version of the International Energy Conservation Code, which requires a minimum installed R-value of 6.0 for conditioned, cooled or heated, and outside air system ductwork and plenums when located inside buildings or spaces. Increase insulation thicknesses as required to comply.
3. Water Vapor Permeance shall be no greater than 0.05 perms per ASTM-E-96.
4. Fire Hazard Classification of installed duct insulation systems shall meet the requirements of ASTM-E-84; Flame Spread of 25, or less; Smoke Developed and Fuel Contributed of 50, or less. All insulation systems, adhesives, mastics, sealants, and tapes shall be U.L. rated for the application. All tapes used shall be acrylic based.
5. All external duct insulation shall be a regularly manufactured product of one of the following:
 - a. Knauf.
 - b. Owens Corning.
 - c. Johns Manville.

- d. Certainteed.
- e. Manson.

B. Duct Insulation - Internal:

1. Internal duct insulation, liner, shall be in thicknesses as indicated herein, and be as specified in Specification Section 23 3000. Duct liner shall be one inch (1") thick on all return, transfer, and relief air ducts, and on portions of general exhaust air ductwork systems as specified elsewhere herein. Internal duct insulation on all conditioned, cooled or heated, supply, all outside air ductwork systems and all mixed air plenums shall be 1-1/2" thick duct liner. Internal liner in sound sensitive spaces shall be 2" thick on both supply and return air ductwork.
2. All duct liner shall be made of glass fiber coated with a bonded mat on the air stream side of the insulation. Coating shall be neoprene based meeting the requirements of NFPA-90A and U.L. Standard 723. Insulation shall not be less than 1.5 lbs. per cu. ft. density, and have a K-value of 0.28 per ASTM-C-177 at a mean temperature of 75 Deg. F.
3. All insulation systems shall meet the requirements of the most recent version of the International Energy Conservation Code, which requires a minimum installed R-value of 6.0 for conditioned, cooled or heated, supply and all outside air system ductwork and mixed air plenums when located inside buildings or spaces. Increase insulation thickness as required to comply.
4. Fire Hazard Classification of installed duct insulation systems shall meet the requirements of ASTM-E-84; Flame Spread of 25, or less; Smoke Developed and Fuel Contributed of 50, or less.
5. All insulation systems, adhesives, mastics, sealants, and tapes shall be U.L. rated for the application.
6. All duct liner shall be suitable for the air velocities to be encountered in each system, and shall generally be suitable for velocities of up to 6000 FPM.
7. Acceptable duct lining manufacturers shall be:
 - a. Certainteed.
 - b. Knauf.
 - c. Owens Corning.
 - d. Johns Manville.
 - e. Manson.

C. Flexible Fire Rated Duct Wrap/Boards for Dryer vents through fire rated walls:

1. Where specified elsewhere herein or where indicated on the Drawings, provide a flexible or board type fire rated duct enclosure system on metal ductwork and portions of hoods exposed above a ceiling, where required by the local Code authority, that allows for zero clearance to combustibles and which can be applied directly to the ductwork, and hood, to minimize space needed for the enclosing materials. The wrap or board materials shall be manufactured in various thicknesses, or be able to be installed in multiple layers of a uniform thickness, to obtain an overall fire rating from one to four hours, and to meet the requirements of the local authority having jurisdiction based on the local codes used.
2. The duct wrap, or board, shall be a noncombustible fire-proofing material capable of withstanding temperatures in excess of 2000 Deg. F. and up to 1,800 Deg. F. on a continuous basis. The fire rating of this material shall be uniform over the entire surface, as installed, and shall be suitable for installation on ducts.

3. Refer to Specification Section 23 3000 for ventilation air duct requirements. Coordinate the fire rated enclosure with that Section of Specifications (typically, minimum 1-hour rated enclosure).
4. Board materials shall be composed of a hydrous calcium silicate made primarily from high purity lime, silica and reinforcing fibers. Joints shall be sealed with a compatible high temperature caulking. Board density shall be a nominal 18 pounds per cubic foot or greater. The R-value shall be approximately 1.7 per inch thickness of the board material. All board materials shall be as manufactured by "PABCO" or approved equals only.
5. Flexible duct wrap materials shall consist of a foil fiberglass reinforced scrim covering over a high temperature rated insulation system designed and rated to provide a fire rated barrier system around duct systems. Flexible duct enclosure systems shall meet all pertinent requirements of the most recent versions of ASTM E2336 and NFPA 96 (Section 4.3.1). This requires a one and one half inch (1-1/2") thick system with two layers of flexible fire wrap. Should the local Code in effect, and the authority having jurisdiction, allow a single layer system complying with the requirements of UL 1978, then this will be permitted. Verify all local code requirements prior to bidding this work. Duct wrap materials shall be as manufactured by:
 - a. 3M Corporation or equals by;
 - b. Thermal Ceramics (Firemaster), or
 - c. FyreWrap by "Unifrax".

PART 3 EXECUTION

3.1 GENERAL

- A. Apply insulation and pipe covering after all of the piping system to be insulated has been pressure tested, found to be completely tight (without leaks), and accepted as such. All insulated T-handles, blow-down valves, extended handles and caps should be installed prior to commencing with insulation. Verify that control, isolation, and balancing valves and any other piping specialty where a valve stem or test port extends beyond the normal pipe insulation thickness to be installed is installed pointed upward vertically. Thoroughly clean and dry all surfaces prior to being covered.
- B. On glass fiber pipe covering with factory applied vapor barrier jacket, lap the jacket on the longitudinal seams and seal with vapor barrier lap adhesive equivalent to Foster 85-20 or Childers CP-82. Tightly butt the ends and cover butt joints with a 4" wide band of vapor barrier jacket secured with the same adhesive.
- C. Where jacketing systems are specified, use standard weight, PVC sheet rolls. Exercise care to locate seams in an inconspicuous place and apply all jacketing neatly, including that on valves and fittings. Unsightly work will be considered a justifiable basis for rejection. Adhere the jacketing in all cases with a lagging adhesive, Foster 30-36 AF (Anti-Fungal) or Childers CP-137 AF, or by other approved methods. Adhesives shall have mold and mildew inhibitors. Lagging adhesives shall meet ASTM D 5590 with a "0" growth rating.
- D. All insulation shall be continuous through wall and ceiling openings and sleeves. Use exterior duct wrap insulation on the outside of smoke and fire damper sleeves. Create a secondary sleeve around the primary sleeve to allow a complete insulation system as allowed by the local authority having jurisdiction.
- E. All insulation and accessories shall have composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) fire and smoke hazard ratings as tested under procedure ASTM E-84, NFPA 255, and UL 723 not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

- F. No insulation shall be applied to the bodies of unions and flanges on building heating water supply and return lines only. Terminate the insulation short of the unions or flanges at this equipment, and bevel off at a forty five degree angle to permit "breaking" the union or removal of the flange bolts without damaging the insulation. Bevel the insulation off also at caps on scale pockets, and blow-off connections on strainers, and at valve bonnets on these same systems.
- G. Unsightly work shall be cause for rejection, including poor application of adhesives and coatings beyond the insulation which coats valves or other piping specialties.
- H. Damage or Modification to Insulation: Where new insulation is disturbed or damaged during the process of installing other new materials, making new connections, etc., it shall be repaired or replaced to return it to its original condition and appearance. Where lines are removed and connections to insulated lines are capped, insulate those caps as well as repairing damaged insulation. Materials shall match those presently installed in thickness, density, insulating value, jacketing, etc.
- I. Hanger and Support Locations: At the location of hangers or supports for pipes run above ground and finished with a vapor seal insulation, provide rigid sections of cork, Foamglas, calcium silicate or high density polyurethane, at least the same thickness as the adjacent insulating material to adequately support the pipe without compression of the insulating material and cover with a vapor seal that is bonded to the adjacent insulation as described for fittings in the lines. Where the insert has an insulating value less than the adjacent pipe insulation the thickness of the insert shall be increased to equal the insulating value of the adjacent pipe insulation. Wood inserts shall not be allowed. Hangers and supports for piping insulation to receive a vapor barrier shall be installed exterior to the insulation.
- J. Material Changes: Wherever there is a change in materials on lines that are vapor sealed, apply a suitable vapor barrier that is compatible with both materials, tapes, etc., as required to maintain the vapor barrier.
- K. The following describes materials, thickness and finishes for insulation on piping. In the following "exposed" shall mean any line or duct exposed below the finished ceiling and structure where no ceiling is installed, in any room space, area, mechanical rooms, closets, and any line or duct run exterior to the building, including above the roof. "Concealed" shall mean any line or duct located above ceilings, in furrings, in chases, in crawl spaces, and buried in direct contact with the soil.
- L. In all "exposed" areas, up to 12'-0" above the finished floor, insulation shall receive a PVC jacketing system. Neatly install all insulation systems not receiving jacketing such that they are suitable for finish painting.
- M. All insulation materials and jacketing shall exhibit the following characteristics:
 - 1. Water absorption, per ASTM C 1104, shall be less than 0.02%.
 - 2. Linear shrinkage, per ASTM C 356, shall be negligible.
 - 3. Stress corrosion, per ASTM C 795, shall not cause corrosion.
 - 4. Corrosiveness, per ASTM C 665, shall not be any greater than sterile cotton.
 - 5. Resistance to fungi, mold and mildew and bacteria, per ASTM C 665, shall be rated as not promoting growth of fungi and bacteria. Inhibitors shall be added to specified products to meet these requirements.

3.2 DUCTWORK

- A. Duct Insulation - Internal: Provide sound absorbing and thermal insulation to the interior surface of the following duct systems: All rectangular low pressure supply, return, relief, transfer, and outside air ducts and supply, mixed, and return air plenums. Internally insulate the first 10 feet of the supply and return air ductwork at all units (split DX AC Units. All ductwork exposed in mechanical equipment rooms or exposed in occupied spaces without ceilings shall be internally lined. Additionally, line the first 10 feet of general exhaust ducts, except fume, and other industrial exhaust systems, on both sides of in-line fans and for the first 10'-0" from the fan curb toward the occupied space for roof mounted fans. All lined ductwork shall be increased in size to maintain the clear inside (air stream) dimensions designated on the Drawings.
1. Duct liner shall be applied in accordance with the manufacturer's recommendations, with the coated, or mat-faced, surface located away from the metal (exposed to air stream). It shall be adhered to the metal with Foster 85-60 or Childers CP-127 adhesive applied to the entire inner surface of the duct. The liner shall be further secured to the duct with Graham Insulating Pins and Clips or other metal clips of the type which do not protrude through the duct. Those clips shall be installed on not greater than 12" centers both ways. All seams and openings in the liner shall be carefully sealed with adhesive.
 2. Paint all joints in liner and butter the edges of sections where sections of ductwork will be joined using Foster No. 30-36 or Childers CP-137, or equivalent approved adhesive. Alternately, use a black "duct butter" which shall be Childers CP-135-2.
 3. Where damper rods occur, suitable metal bushings shall be provided on each end of the damper rod inside the duct, to provide clearance between the damper blade and the lining.
 4. Refer to Section 23 3000 as applicable, Air Distribution Duct Systems.
 5. Due to the most recent version of the International Energy Conservation Code, conditioned air, heated or cooled air (includes outside air intake ductwork), ductwork insulation located inside the building envelope shall have a minimum installed R-value of 6.0. For lined ductwork, this shall be accomplished by using 1-1/2" thick duct liner. Coordinate insulation requirements with other Sections of these Specifications.
- B. Duct Insulation - External:
1. Externally insulate all rectangular and round supply and return air ducts not containing internal lining. (Kitchen hood make-up air ducts shall not contain internal lining and shall always be externally insulated).
 2. Additionally insulate the outside of all fire, fire-smoke, and smoke damper sleeves penetrating walls and floors to insure a continuous insulation system.
 3. External insulation shall be applied in accordance with the manufacturer's recommendations by impaling over pins using speed clips or be secured with adhesive.
 4. Seal all joints, breaks, fastener penetrations and punctures with a 3" wide vapor barrier strip similar to that of facing materials secured with adhesive. Pins shall be spaced 12" on center both ways. Adhesive shall cover the entire duct surface.
 5. Blanket type insulation shall generally be used on concealed ductwork only with rigid insulation board being used exclusively on exposed ductwork, which shall also receive a PVC jacket when located 12'-0", or less, above the finished floor.
 6. Vapor Seal all jacketing penetrations, cut openings, cut edges, and taped seams with an approved vapor barrier coating, Foster 30/33 or Childers CP-33

vapor barrier coating. All vapor barrier coatings shall have a maximum permeance rating of 0.07 or less at 45 mils dry per ASTM-E-96, procedure B.

3.3 SHIELDS AND INSERTS

- A. Metal saddles, shields, shall be applied between hangers or supports and the pipe insulation. Saddles shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for hanger inserts. Shields shall be made of galvanized sheet metal and shall be of sufficient size and length to prohibit the crushing of the insulation materials. Saddle shields shall be as follows:

Pipe Size	Metal Saddles	
	Metal Gauge	Length
3/4" to 3"	18	12"
4" to 6"	16	12" - 18"
8" to 10"	14	24"
12" & Larger	12	24"

- B. Provide inserts of calcium silicate on hot piping and cellular glass or 7#/Cu. Ft. fiber glass pipe insulation on cold piping at hangers except pipes 1-1/2" or smaller in size. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of a thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Insulation inserts shall not be less than the following lengths:

Pipe Size	Insert Length
3/4" to 3"	12"
4" to 6"	12" - 18"
8" to 10"	24"
12" & Larger	24"

END OF SECTION

SECTION 23 0800

MECHANICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 DESCRIPTION

- A. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - 2. Verify and document proper performance of equipment and systems.
 - 3. Verify that Systems and Operations and Maintenance (O&M) documentation is complete.
 - 4. Verify that the Owner's operating personnel are adequately trained in the O&M of these systems.
- B. The systems to be commissioned include: split DX A/C units, electric unit heaters, exhaust systems, condensing units, fans, and all related controls.
- C. Commissioning requires the participation of Division 23 and 26 system installers to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 installers shall be familiar with all parts of the commissioning plan issued by the Commissioning Authority (C.A.) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.
- D. Commissioning Team members shall consist of the Commissioning Authority (C.A.), the designated representative of the Owner, the General Contractor (GC, CM or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the Testing, Adjusting, and Balancing (TAB) representative, the Controls Contractor (CC), and any other installing subcontractors or suppliers of equipment pertinent to the complete installation of Division 23 and 26 Systems intended to be Commissioned. The Owner's representative for operations and maintenance shall also be a member of the commissioning team.

1.3 COMMISSIONING AUTHORITY

- A. The commissioning authority or agency shall be selected and employed by the building owner. The commissioning agent shall be a licensed professional engineer in the State where the work will be performed, and shall be experienced in the commissioning of mechanical and electrical systems of the type installed in this project. Experience in the construction process, direct digital control systems, Testing, Adjusting, and Balancing; and ASHRAE Guideline 1.1-2007 is mandatory. The commissioning agent shall not be associated with or employed by a mechanical contractor, or equipment supplier.
Commissioning shall be paid for and provided by the District. District shall select

the commissioning authority at an early stage of the project and notify the Contractor of the C.A. that shall be employed.

1.4 COMMISSIONING PLAN

- A. Commissioning Plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will provide the plan, which will continue to evolve and expand as the project progresses. The project *Specifications* shall take precedence over the *Commissioning Plan*.
- B. Commissioning Process includes a narrative that provides a brief overview of the typical commissioning tasks during construction and the general order in which they will occur.
 - 1. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
 - 2. Additional meetings will be required throughout the active construction phase, as scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
 - 3. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
 - 4. The CA works with the pertinent subcontractors in developing startup plans and startup documentation formats, including prefunctional checklists to be completed, during the startup process.
 - 5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.
 - 6. The Subcontractors, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment.
 - 7. The Subcontractors develop proposed specific equipment and system functional performance test (FPT) procedures. The CA will review these procedures and develop the official FPT procedures to be incorporated into the project.
 - 8. The procedures are executed by the Subcontractors, under the direction of, and documented by the CA.
 - 9. Items of non-compliance in material, installation or setup are corrected at the Subcontractor's expense and the system is then retested.
 - 10. The CA reviews the O&M documentation for completeness.
 - 11. Commissioning is intended to be completed before Substantial Completion.
 - 12. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that it was completed.
 - 13. Deferred testing is conducted, as specified or as required.

1.5 RESPONSIBILITIES

- A. General Contractor (GC):
 - 1. Facilitate the coordination of the commissioning work as outlined by the CA, and with the assistance of the CA, ensure that all commissioning activities are being scheduled into the master construction schedule.
 - 2. Include all costs of commissioning, as outlined herein and elsewhere, in the total contract price.

3. Furnish one (1) copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to equipment to be commissioned to the CA.
4. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and complete training.
5. Ensure that all subcontractors execute their commissioning responsibilities according to the Contract Documents and schedule.
6. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Commissioning process.
7. Coordinate the training to be provided to the Owner's personnel.
8. Prepare O&M manuals and systems manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to "as-built" conditions.
9. Warranty Period:
 - a. Ensure that Subcontractors execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
 - b. Ensure that Subcontractors correct deficiencies and make necessary adjustments to O&M manuals and "as-built" drawings for applicable issues identified in any seasonal testing.

B. Mechanical and Controls Systems Installers:

1. Commissioning responsibilities applicable to each of the mechanical and controls (systems installers) of Division 23 are as follows (all references apply to commissioned equipment only):
 - a. Construction and Acceptance Phases:
 - 1) Include the cost of commissioning in the contract price.
 - 2) In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, Systems and O&M data and training.
 - 3) Attend a commissioning scoping meeting and other meetings necessary to facilitate the Commissioning process.
 - 4) Contractors shall provide the CA with normal cut sheets and shop drawing submittals of all equipment to be commissioned.
 - 5) Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
 - a) Typically, this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
 - b) The Commissioning Agent may request further documentation necessary for the commissioning process.

- 6) Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
- 7) Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
- 8) Preparing proposed specific functional performance test procedures for submission to and consideration of the CA. The CA will use these submittals to prepare finalized test procedures. Subcontractors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests, as applicable.
- 9) Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to startup.
- 10) During the startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
- 11) Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
- 12) Address current A/E punch list items before functional testing. Air TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air related systems.
- 13) Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.
- 14) Perform functional performance testing under the direction of the CA for specified equipment. Assist the CA in interpreting the monitoring data, as necessary.
- 15) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, and A/E and retest the equipment.
- 16) Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to "as-built" conditions.
- 17) Prepare redline "as-built" drawings for all drawings and final "as-builts" for contractor-generated coordination drawings.
- 18) Provide training of the Owner's operating personnel as specified.
- 19) Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

b. Warranty Period:

- 1) Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.
- 2) Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

C. Mechanical (Systems Installer) Contractor:

1. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:
 - a. Provide startup for all HVAC equipment, except for the building automation control system.
 - b. Assist and cooperate with the TAB contractor and CA by:
 - 1) Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
 - 2) Including cost of sheaves and belts that may be required by TAB.
 - 3) Providing temperature and pressure taps in piping and equipment according to the Construction Documents for TAB and commissioning testing. Verify locations for taps with the CA before installation.
 - c. Prepare a schedule for Division 23 equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
 - d. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

D. Controls (Systems Installer) Contractor (CC):

1. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:
 - a. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
 - 1) An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
 - 2) All interactions and interlocks with other systems.
 - 3) Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
 - 4) Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
 - 5) Start-up sequences.
 - 6) Warm-up mode sequences.
 - 7) Normal operating mode sequences.
 - 8) Unoccupied mode sequences.
 - 9) Shutdown sequences.
 - 10) Capacity control sequences and equipment staging.
 - 11) Temperature and pressure control: setbacks, setups, resets, etc.
 - 12) Detailed sequences for all control strategies, e.g., optimum start/stop, staging, optimization, demand limiting, etc.
 - 13) Effects of power or equipment failure with all standby component functions.
 - 14) Sequences for all alarms and emergency shut downs.
 - 15) Seasonal operational differences and recommendations.

- 16) Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 17) All sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.
- b. Control Drawings Submittals shall include:
- 1) Control drawings shall have a key to all abbreviations.
 - 2) Control drawings shall contain graphic schematic depictions of each system and each component.
 - 3) Schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
 - 4) Provide a full points list with at least the following included for each point:
 - a) Controlled system.
 - b) Point abbreviation.
 - c) Point description.
 - d) Display unit.
 - e) Control point or setpoint (Yes / No).
 - f) Monitoring point (Yes / No).
 - g) Intermediate point (Yes / No).
 - h) Calculated point (Yes / No).
 - i) Key:
 - (1) Point Description: DB temp, airflow, etc.
 - (2) Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)
 - (3) Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).
 - (4) Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
 - (5) Calculated Point: "Virtual" point generated from calculations of other point values.
 - 5) Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.
- c. An updated "as-built" version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.
- d. Assist and cooperate with the TAB contractor in the following manner:
- 1) Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).

- 2) Have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
 - 3) Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
- e. Assist and cooperate with the CA in the following manner:
- 1) Execute the functional testing of the controls system as specified for the controls contractor.
 - 2) Assist in the functional testing of all equipment specified.
- f. Controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing, according to the process. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
- 1) System name.
 - 2) List of devices.
 - 3) Step-by-step procedures for testing each controller after installation, including:
 - a) Process of verifying proper hardware and wiring installation.
 - b) Process of downloading programs to local controllers and verifying that they are addressed correctly.
 - c) Process of performing operational checks of each controlled component.
 - d) Plan and process for calibrating valve and damper actuators and all sensors.
 - e) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
 - 4) A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each point and clearly indicate when a sensor or controller has "passed" and is operating within the contract parameters.
 - 5) A description of the instrumentation required for testing.
 - 6) Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CA and TAB contractor for this determination.
- g. Provide a signed and dated certification to the CA and CM or GC upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
- h. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified.
- i. List and clearly identify on the "as-built" duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

- E. TAB Contractor. The duties of the TAB contractor, in addition to those listed above are:
1. Submit the outline of the TAB plan and approach for each system and component to the CA prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
 2. Submitted plan will include:
 - a. Reviewed the construction documents and the systems to sufficiently understand the design intent for each system.
 - b. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Detailed step-by-step procedures for TAB work for each system and issue.
 - d. Plan for formal deficiency reports (scope, frequency and distribution) and final report.
 3. Submit reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA as required.
 4. Communicate to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB, which affect the control system setup and operation.
 5. Provide a draft TAB report to the CA. The report should follow the latest reporting recommendations by AABC.
 6. Provide the CA with any requested data, gathered, but not shown on the draft reports.
 7. Provide final TAB reports in the number required.
- F. Equipment Suppliers:
1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 2. Assist in equipment testing per agreements with Subs.
 3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CA.
 4. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
 5. Review test procedures for equipment installed by factory representatives.
- G. Commissioning Agent (CA):
1. The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance items or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance so that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. Contractor and all subcontractors shall provide all tools or the use of tools to start, checkout and functionally test equipment and systems, to include any specified or required testing equipment needed to conduct these tests.
 2. Construction Phase:

- a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
- b. Coordinate the commissioning work and, with the GC, ensure that commissioning activities are being scheduled into the master schedule.
- c. Revise, as necessary, *Commissioning Plan—Construction Phase*.
- d. Plan and conduct a commissioning scoping meeting.
- e. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
- f. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
- g. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, along with A/E reviews.
- h. Assist in the development of prefunctional tests and checklists.
- i. Assist in the development of an enhanced start-up and initial systems checkout plan with Subcontractors.
- j. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
- k. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owners project manager of any deficiencies in results or procedures.
- l. Witness all or part of any ductwork testing and cleaning procedures, if required, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
- m. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot-checking.
- n. Approve systems startup by reviewing start-up reports and by selected site observation.
- o. With necessary assistance and review from installing contractors, review the functional performance test procedures for equipment and systems. This may include energy management control system trending, or manual functional testing.
- p. Analyze any functional performance trend logs and monitoring data to verify performance.
- q. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
- r. Review equipment warranties to ensure that the Owner's responsibilities are clearly defined.
- s. Oversee and approve the training of the Owner's operating personnel.

- t. Compile and maintain a commissioning record and building systems book(s).
 - u. Review and approve the preparation of the O&M and Systems manuals.
 - v. Provide a final commissioning report.
- 3. Warranty Period:
 - a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
 - b. Return to the site at 10 months into the 12-month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

1.6 SCHEDULING

- A. The CA will work with the GC according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the CM and GC for scheduling commissioning activities.
- B. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the applicable Division 23 or 26 contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by the TAB firm in their commissioning responsibilities.
- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents, shall be included in the Base Bid price of the Contractor and be left on site.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in 23 05 93. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year and a resolution of + or - 0.5°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed to the test equipment or certificates of calibration shall be readily available with a copy being furnished to the C.A. for their records.

PART 3 EXECUTION

3.1 MEETINGS

- A. Scoping Meeting. Within 90 days of commencement of construction, the CA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the GC. Information gathered from this meeting will allow the CA to revise the *Commissioning Plan* to its “final” version, which will also be distributed to all parties.
- B. Miscellaneous Meetings will be planned and conducted by the CA as required as the construction phase progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subcontractors. The CA will plan these meetings and will minimize unnecessary time being spent by Subcontractors, or any other member of the Commissioning Team.

3.2 REPORTING

- A. CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.
- B. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.
- C. A final summary report by the CA will be provided focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will be part of the final report, and the entire report will be included in the O&M manuals.

3.3 SUBMITTALS

- A. CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent. All documentation requested by the CA will be included by the Subs in their O&M manual contributions.
- B. Commissioning Agent will be given the opportunity to review all pertinent submittals related to equipment or systems to be commissioned for conformance to the Contract Documents, and more specifically as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning Agent will notify the appropriate persons as requested, of items missing or areas that are not in conformance with Contract Documents as it relates to the commissioning process, and which require resubmission.

- C. CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.
- D. Submittals sent to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, although the CA will review them.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment to be commissioned. Some systems that are not comprised so much of actual dynamic machinery may have very simplified PCs and startup.
- B. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
- C. Start-up and Initial Checkout Plans will be required by the CA who shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements.
 - 1. Checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
 - 2. Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form may have more than one trade responsible for its execution.
 - 3. Each Subcontractor responsible for the purchase of each item of equipment shall develop the full start-up plan for that equipment by combining (or adding to) the CA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:
 - a. Prefunctional checklists developed jointly by the CA and the subcontractors.
 - b. Manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - c. Manufacturer's normally used field checkout sheets.
 - 4. Each Subcontractor shall submit the full startup plan for which they are responsible to the CA for review and approval.
 - 5. CA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.
 - 6. Full start-up procedures and the approval form may be provided to the CM for review and approval, depending on management protocol.

- D. Sensor Calibration of all sensors shall be included as part of the prefunctional checklists performed by the Contractors, according to the following procedures:

1. Sensors Without Transmitters, Standard Application type, shall include taking readings with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

<u>Sensor</u>	Required Tolerance (+/-)		Sensor	Required Tolerance (+/-)
Unit wet bulb or dew point	1.0 Deg.F.		Flow rates, air	10%of design
Indoor and outdoor air pressure differential	0.05 Inches W.G.		Pressures, air	5% of design
Outside air, space air, coil air temps	1.0 Deg.F.		Watt-hour, voltage & amperage	2%

- E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subcontractors and pertinent vendors shall schedule startup and checkout with the GC and CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.
2. CA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved).
3. For lower-level components of equipment, (e.g., fans, sensors, controllers), the CA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.
4. Subcontractors and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for supervisors to fill out these forms if they have not witnessed the test.

- F. Deficiencies, Non-Conformance and Approval in Checklists and Startup:

1. Subcontractors shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CA within two days of test completion.
2. CA reviews the report and submits either a non-compliance report or an approval form to the Sub or GC. The CA shall work with the Subcontractors and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the GC and others as necessary. The installing Subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report and a

Statement of Correction on the original non-compliance report. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system using a standard form.

3.5 FUNCTIONAL TESTING

- A. This sub-section applies to all commissioning functional testing for all Divisions.
- B. Objectives and Scope of functional testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, no flow, equipment failure, etc. shall also be tested.
- C. Development of Written Test Procedures shall begin with the CA obtaining all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CA shall then, with the assistance the contractor, develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Subcontractor or vendor responsible to execute a test, shall provide assistance to the CA in developing the procedures (answering questions about equipment, operation, sequences, etc.). Prior to execution, Subcontractors shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the A/E for review, if requested. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
- D. Test Methods shall include the following:
 - 1. Functional testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CA will determine which method is most appropriate for tests that do not have a method specified.
 - 2. Simulated Conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
 - 3. Altering Set points rather than overwriting sensor values, and when simulating conditions is difficult, altering set points to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
 - 4. Setup of each function and testing shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
- E. Coordination and Scheduling by the Subcontractors shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the GC and

affected Subcontractors. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subcontractors shall execute all tests. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

- A. Documentation by the CA shall include witnessing and documenting the results of all functional tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the GC for review. CA will include the filled out forms in the Commissioning Report.
- B. Non-Conformance.
 - 1. CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported on a standard non-compliance form.
 - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form.
 - 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
 - 4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
 - a. When there is no dispute on the deficiency and the Subcontractor accepts responsibility to correct it:
 - 1) CA documents the deficiency and the subcontractor response and intentions and they go on to another test or sequence
 - b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - 1) The deficiency shall be documented on the non-compliance form with the Subcontractor's response and a copy given to the GC and to the Subcontractor representative assumed to be responsible.
 - 2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
 - 3) The CA documents the resolution process.
 - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The CA reschedules the test and the test is repeated until satisfactory performance is achieved.
 - 5. Cost of Retesting for the Subcontractor to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.

6. Contractor shall respond in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
 7. CA retains the original non-conformance forms until the end of the project.
- C. Approval by the CA shall include notation of each satisfactorily demonstrated function on the test form. CA recommends acceptance of each test using a standard form. The Owner gives final approval on each test using the same form, providing a signed copy to the CA and the Contractor.

3.7 SYSTEMS and OPERATION AND MAINTENANCE (O&M) MANUALS

- A. Following System and O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.
- B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the GC for inclusion in the O&M manuals, according to this section, prior to the training of owner personnel.
- C. CA shall receive a copy of the Systems/O&M manuals for review.
- D. Special Control System O&M Manual Requirements shall include, in addition to documentation that may be specified elsewhere, the controls contractor compiling and organizing, at minimum, the following data on the control system in labeled 3-ring binders with indexed tabs:
 1. Three (3) copies of the controls training manuals in a separate manual from the O&M manuals.
 2. Operation and Maintenance Manuals containing:
 - a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included if required in the controls specification section.
 - b. Full as-built set of control drawings.
 - c. Full as-built sequence of operations for each piece of equipment.
 - d. Full points list. In addition to the updated points list required in the original submittal.
 - e. Full print out of all schedules and set points after testing and acceptance of the system.
 - f. Full as-built print out of software program as required.
 - g. Electronic copy on disk of the entire program for this facility if required.
 - h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
 - i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
 - j. Control equipment component submittals, parts lists, etc.
 - k. Warranty requirements.
 - l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
 3. Manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

- a. Sequences of operation.
 - b. Control drawings.
 - c. Points lists.
 - d. Controller / module data.
 - e. Thermostats and timers.
 - f. Sensors and DP switches.
 - g. Valves and valve actuators.
 - h. Dampers and damper actuators.
 - i. Program setups (software program printouts).
- 4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.
- E. Review and Approval of the commissioning related sections of the Systems and O&M manuals shall be made by the A/E and the CA.

3.8 TRAINING OF OWNER PERSONNEL

- A. GC shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.
- B. CA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.
- C. Mechanical Contractor shall have the following training responsibilities:
 - 1. Provide the CA with a training plan two weeks before the planned training.
 - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, pumps, heat rejection equipment, air conditioning units, air handling units, fans, controls and water treatment systems, etc.
 - 3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
 - 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
 - 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
 - 6. Controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
 - 7. Training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
 - 8. Training shall include:
 - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
 - b. A review of the written Systems/O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall

- include start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
 - c. Discussion of relevant health and safety issues and concerns.
 - d. Discussion of warranties and guarantees.
 - e. Common troubleshooting problems and solutions.
 - f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.
 - g. Discussion of any peculiarities of equipment installation or operation.
 - h. The format and training agenda in *The HVAC Commissioning Process, ASHRAE Guideline 1.1-2007* is recommended.
 - i. Classroom sessions shall include the use of overhead projections, slides, and video/audio-taped material as might be appropriate.
9. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.
 10. Mechanical contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not *controlled* by the central control system.
 11. Duration of Training by the mechanical contractor shall include providing training of sufficient length on each piece of equipment according to the requirements of the preceding specification sections. If not listed in the equipment sections, the following schedule shall be used.

<u>Hours</u>	<u>System</u>
<u>2</u>	Exhaust Fans and Special Exhaust Systems
<u>4</u>	Split DX A/C Units

D. Controls Contractor shall have the following training responsibilities:

1. Provide the CA with a training plan four weeks before the planned training.
2. Controls contractor shall provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on all the capabilities of the control system.
3. Training manuals shall include the standard operating manual for the system and any special training manuals which shall be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals *and* in all software displays. Copies of audiovisuals shall be delivered to the Owner.
4. Training will be tailored to the needs and skill-level of the trainees.
5. Trainers will be knowledgeable on the system and its use in buildings. The Owner shall approve the instructor prior to scheduling the training.
6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
7. Controls contractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
8. There shall be three training sessions:

- a. Training I - Control System: The first training shall consist of 24 hours of actual training. This training may be held on-site or in the supplier's facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each student, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - b. Training II - Building Systems: The second session shall be held on-site for a period of 8 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:
 - 1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
 - 2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
 - 3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
 - 4) Every screen shall be completely discussed, allowing time for questions.
 - 5) Use of keypad or plug-in laptop computer at the zone level.
 - 6) Use of remote access to the system via phone lines or networks if included.
 - 7) Setting up and changing an air terminal unit controller.
 - c. Training III - General Overview: The third training will be conducted on-site six months after occupancy and consist of 8 hours of training. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the system.
- E. TAB contractor shall have the following training responsibilities:
 - 1. TAB shall meet for 2 hours with facility staff after completion of TAB and instruct them on the following:
 - a. Go over the final TAB report, explaining the layout and meanings of each data type.
 - b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 - c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 - d. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 - e. Other salient information that may be useful for facility operations, relative to TAB.

3.9 WRITTEN WORK PRODUCTS

- A. Written work products of Contractors will consist of the start-up and initial checkout plan described and the filled out start-up, initial checkout, pre-functional, and functional checklists, training plans and records of training. These work products will be supplied to the CA to be included in the final commissioning report.

END OF SECTION

SECTION 23 0900

INSTRUMENTATION AND CONTROLS FOR HVAC

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with Section 23 0500, General Provisions, and all other Division 23 Sections, as applicable.
- C. Refer to other divisions for coordination of work with other trades.

1.2 SYSTEM DESCRIPTION

- A. The scope shall include the furnishing and installing of Energy Management System devices with new direct digital controllers, all local and remote control panels, temperature control field devices, appurtenances, etc., to accomplish specific control sequences specified herein, to provide fire and freeze protection; cocks and wells for various temperature and pressure control, sensing and indicating devices; pressure and temperature indicating instruments; supporting structures, and other required components for a complete and operating system.
- B. The scope shall include all new electric connections to new thermostats, sensors, valves, dampers and actuators, switches and relays, and all other new components of the system requiring electric connections.
- C. The scope shall further include all temperature control and interlocking wiring and wiring devices, including raceways, as indicated herein.
- D. Provide all software programs as required to effect the sequences of control, monitoring, reporting, etc., as indicated herein.
- E. The new system installed shall be fully automatic, subject to various types of remote surveillance, routine remote adjustments, remote status, remote alarms, remote data collection for trending/historical files, and other operations as indicated herein, from a new local remote microprocessor-based Local Area Network (LAN), with the local system capable of stand-alone operation. The system shall be capable of being monitored and controlled remotely off site by a Central Processing Unit (CPU) at the Facilities Central Maintenance Office via modem and telephone line, or on the District LAN. The entire system of control and automation at this building shall thus become an integral part of the existing facilities Energy Management System (EMS).
- F. Bidders are specifically advised that full and effective two-way communication between the new system installed under this contract and the Owner's existing CPU must be achieved in an approved manner, including whatever may be required in the form of interface hardware and software without effecting or interrupting other system software. Simultaneous on-line communication of this system and others with the Central EMS is mandatory.
- G. This system of equipment and software shall be provided and installed by the single local factory trained and authorized sales, installation and service agent of Enviromatic Systems (Reliable Controls).

1.3 QUALITY ASSURANCE

- A. The equipment provided under this Section of the Specifications shall be installed, calibrated, adjusted, and put in completely satisfactory operation by a Control Systems installer experienced in this type of work.
- B. The successful Control Systems installer shall meet the following requirements:
 - 1. All spare parts must be locally stocked and readily available within a 24 hour period.
 - 2. Service personnel shall be available, on call, on a 24 hour a day, year round basis, or service personnel will respond by visitation to the site within four (4) hours of a service call considered serious in nature or classified by the Owner as an emergency.
 - 3. Be able to provide evidence of having successfully installed similar sized and types of systems for a minimum of ten (10) years.
- C. All control devices shall be as specified in the technical portion of this section of the specifications. The system shall be installed by workmen skilled, experienced, and specifically trained in the application, installation, calibration, adjusting, and testing of instrumentation of the type specified.
- D. All control system components shall operate satisfactory without damage at 110% above and 85% below rated voltage and at ± 3 hertz variation in line frequency. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interference. All bus connected devices shall be A.C. coupled, or equivalent, so that any single device failure will not disrupt or halt bus communications. Provide line voltage input protection to all network level controllers to protect these devices from over-voltage and lightning strike conditions.
- E. A service representative of the installer shall check the instrumentation for proper installation, calibrate all instruments and make all adjustments necessary to ensure proper operation of the system in full cooperation with the Testing, Adjusting, and Balancing (TAB) Firm. Refer to Section 23 0593. All instruments and software required for checking, calibrating, and proving the system shall be provided under this Section of the Specifications. The service representative shall spend sufficient time with all of the Owner's Representatives after the system is installed and properly functioning to instruct the Owner's Representative (Operations and Maintenance Personnel) in the operation of the system for a minimum of sixteen (16) hours for the basic Controls System and twenty-four (24) hours for the EMS. At final completion of the installation provide personnel and instruments of satisfactory quality available to check the calibration of all instruments, and to demonstrate system operation as described in "Sequences of Operation".
- F. All basic control devices, parts, and other materials, shall be standard catalog products of a single reputable manufacturer and shall essentially duplicate equipment which has been in satisfactory service for at least one (1) year. All materials and parts shall be items in current production by the manufacturers. First of a kind new technology devices will not be considered. Accessory equipment that is required to make a complete and functioning system that is not of the same manufacturer furnishing the basic control equipment shall carry the guarantee of the basic control equipment manufacturer and repair and replacement parts shall be available through normal local trade channels.
- G. All software updates and enhancements which evolve during the first year warranty period following system acceptance, "Substantial Completion", shall be furnished to the Owner without additional cost. This shall include the local stand-alone direct digital controllers and the building network manager computer(s).

- H. Furnish an extended one (1) year warranty beyond the standard one (1) year warranty for the EMS to include all electronic components and control devices associated therewith. Provide additional three (3) year parts warranty beyond this for a total of five (5) years for all dampers and actuators.
- I. All network level controllers shall be ASHRAE BacNET and shall communicate with all other BacNET Protocol communication systems at the building network level.

1.4 SYSTEM START-UP AND COMMISSIONING

- A. After completion of the installation, Contractor shall place the system in operation and shall perform all necessary testing and debugging operations of the basic systems and EMS.
- B. An acceptance test shall be performed in the presence of the Testing, Adjusting, and Balancing (TAB) Company, to verify correct sequences of operation, calibration, and operation of the Controls and Energy Management System, when installed, with every part of the system functioning satisfactorily and having been fully commissioned, and with no outstanding items requiring completion or correction, the system will be accepted by the Architect and Owner for "Substantial Completion", and will then be placed under Warranty.
- C. The Automatic Temperature Control and Energy Management System Installer shall thoroughly check all controls, sensors, operators, sequences, etc., before notifying the TAB Agency that the Automatic Temperature Controls and Energy Management System are operational. The Automatic Temperature Control and Energy Management System Installer shall provide technical support (technicians and necessary hardware and software) to the TAB Agency to allow for a complete check-out of these systems.

1.5 SUBMITTALS

- A. Submittals shall be complete and be in full accordance with Section 23 0500, General Provisions.
- B. Submittals shall include complete, continuous line, point to point wiring diagrams including tie-in points to equipment with written sequences of control adjacent to pertinent control diagrams. Specification sheets shall be submitted on each piece or type of equipment in a separate brochure and show sufficient detail to indicate compliance with these specifications. Drawings and Specification sheets shall show setpoints, throttling ranges, actions, proportional bands, and integration constants, where applicable. Complete brochures shall include the wiring diagrams as well as operating and maintenance instructions on the equipment.
- C. Complete and approved shop drawings shall be obtained prior to commencing installation work, unless otherwise approved by the Owner or Owner's Representative.
- D. Tag numbers, as shown or specified, shall appear for each item on the wiring diagrams and data sheets. Data sheets shall properly reflect in every detail the specific item submitted.
- E. After completion of the work, Contractor shall prepare and furnish maintenance brochures for the Owner. The maintenance brochures shall include operating instructions, specifications, and instruction sheets for all instruments and a complete set of "As-Built" control drawings. After approval of submittal, completion of all installation work, software checkout, and system commissioning in conjunction with the Testing, Adjustment and Balance (TAB) Firm, furnish to the Owner the following:
 - 1. One (1) set of Blue or Black line prints of "As-Built" drawings, half size (11" X 17"), inserted in a three-ring binder.

2. One (1) copy of the final approved Shop Drawings in suitably sized three ring binders.
 3. A USB Drive with all documents indicated above, to include Operations and Maintenance Manuals and spare parts list included thereon included in PDF format.
- F. Provide a complete replacement spare parts list to the Owner.

1.6 EMS SOFTWARE TOOLS AND LICENSES

- A. Submit a copy of all software installed on the servers and workstations related to this project.
- B. Submit all licensing information for all software installed on the servers and workstations.
- C. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.
- D. Submit all licensing information for all of the software used to execute the project.
- E. All software revision shall be as installed at the time of system acceptance.

1.7 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored, and which is damaged or defaced during construction shall be rejected.
- B. Cover control panels, open ends of control piping and open ends of control valves stored on site until just prior to installation of wiring and valves respectively.
- C. Storage and protection of materials shall be in accordance with Division 1.

PART 2 PRODUCTS

2.1 TEMPERATURE SENSORS

- A. Temperature sensors shall be nickel wire thermistor, 10,000 or 30,000 ohm resistance, or RTD Type, with 1000 ohms resistance at 70 Deg.F., and a 3 ohms/per degree F temperature coefficient.
- B. Ambient temperature limits shall be minimum of 0-125 Deg.F. with a +/- 0.25% accuracy of nominal resistance at 70 Deg.F.
- C. Condenser water temperature sensors and cabling shall be hermetically sealed to prevent condensation damage to conductors or elements. Sensors for immersion locations shall not be affected by vibrations encountered in normal piping systems.
- D. Mixed air temperature sensors shall be the averaging capillary type to sense duct temperature across the full duct width. Minimum sensor length shall be 15 feet and include adequate supports for element within the duct or at the face of the coil, maintain minimum one inch (1") separation from coil.
- E. Furnish sensors with maximum 6 to 9 inch insulated pigtail leads or trim sensor pigtail leads to meet this criteria once installed.
- F. All sensor actions shall be the same for the entire building.
- G. Mount all room wall sensors at 48" inches above finished floor to comply with A.D.A., unless indicated or approved otherwise by the Architect or Owner's Representative.
- H. Wall space temperature sensors shall include the following accessories, features and functions:

1. Normal Increase/Decrease Temperature Setpoint adjustments; limits set through software (initially use ± 2 Deg.F.).
 2. Impact Resistant Lexan type cover material.
 3. Local override pushbutton to energize controlled equipment.
 4. Local operator interface communication service jack compatible with mobile trouble shooting terminal unit. Alternately, provide spare service jack on terminal equipment controller on controlled terminal equipment.
- I. Sensors shall be as manufactured by Reliable Controls; Automation Components, Inc. (ACI); or Veris Industries.

2.2 RELATIVE HUMIDITY SENSORS

- A. Provide a 100% solid state copolymer wafer, of bonded layer hygrometric materials, humidity sensor and transducer. Sensor shall require no periodic maintenance or recurring calibration. Sensor shall be linear and temperature compensated.
- B. Sensor shall have $\pm 2\%$ Relative Humidity (RH) accuracy over a 100% RH range and $\pm 1\%$ over the 30-80% RH range.
- C. Sensor shall produce outputs of 4-20 mA or 1-11 VDC.
- D. Sensor shall be in an impact resistant cover with ventilating openings in occupied spaces. Provide duct or remote mount probes as required for the application.
- E. Wall mounted sensors shall be mounted 48 inches above finished floor to comply with A.D.A., unless indicated or otherwise approved by the Architect or Owner's Representative.
- F. Acceptable Manufacturers:
 1. Vaisala ($\pm 2\%$ to 3% acceptable).
 2. General Eastern ($\pm 2\%$ to 3% acceptable).
 3. Automation Components, Inc. (ACI).
 4. Veris Industries.
 5. Reliable.

2.3 AUTOMATIC DAMPERS

- A. Provide all control dampers, under this Section of the Specifications, of the types and sizes indicated on the Drawings, including but not limited to outside air intakes, return, relief, and other motorized air control dampers where shown, or where not an integral part of the equipment furnished and specified in other sections of these specifications. All dampers shall be special low leakage extended performance type.
- B. Damper frames shall be not less than 16 gauge galvanized steel formed for extra strength with mounting holes for flange and enclosed duct mounting.
- C. Dampers shall be available in two-inch size increments from 8" horizontal and vertical to 48". Requirements for dampers over 48" in size shall be met by using standard modules with interconnecting hardware to limit damper blade length to a maximum of 48". Provide separate actuator for damper modules exceeding 32.0 square feet and as required for smaller sizes due to torque requirements.
- D. All damper blades shall be not less than 16 gauge galvanized steel roll formed for high velocity performance. Blades on all dampers must be not over 6" wide.
- E. Blade bearings shall be nylon or oilite with 1/2" zinc plated steel shafts.
- F. All blade linkage hardware shall be of corrosion-resistant finish and readily accessible for maintenance after installation.

- G. Provide continuous replaceable neoprene or butyl rubber edging seals for all outdoor and relief air dampers where blade edges meet when dampers are closed. Spring loaded stainless steel side jamb seals shall be provided for all dampers.
- H. Dampers and seals shall be suitable for temperature ranges of -20 degrees F to 200 degrees F at specified leakage ratings.
- I. Dampers used for proportional control shall have opposed blades.
- J. Leakage rates for all controlled dampers shall not exceed 5 CFM of air flow per square foot of face area based on a 16 square foot damper, at 1.0" W.C. differential, rated in accordance with AMCA 500. Furnish test data with submittals.
- K. Acceptable manufacturers (No other manufacturers will be allowed):
 - 1. Johnson Controls, Inc.
 - 2. Honeywell, Inc.
 - 3. American Warming and Ventilating, Inc.
 - 4. Ruskin.

2.4 ELECTRIC DAMPER ACTUATORS

- A. All control dampers shall receive electric actuators.
- B. Electronic direct-coupled actuation devices shall be provided.
- C. Electric Actuators shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a "V" bolt design with associated "V" shaped toothed cradle attaching to the shaft for maximum strength and to eliminate slippage.
- D. Spring return actuators shall have a "V" clamp assembly of sufficient size to be directly mounted to an integral jack shaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or set screw type fasteners are not acceptable.
- E. Actuators shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
- F. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable. This applies to all dampers directly connected to outside and relief air systems. All spring return actuators shall be capable of both clockwise and counterclockwise spring return operation by simply changing the mounting orientation.
- G. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control input and provide a 2 to 10 VDC or 4 to 20 mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. Floating point type control is acceptable on fan coil units, unit heaters and variable air volume terminals. All actuators shall provide a 2 to 10 VDC position feedback signal.
- H. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120 VAC power shall not require more than 10 VA.
- I. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper or valve when the actuator is not powered. Spring return actuators with more than 60 in-lb torque capacity shall have a manual crank for this purpose.

- J. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.
- K. Actuators shall be provided with a conduit fitting and a minimum three-foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
- L. Actuators shall be Underwriters Laboratories Standard 873 listed.
- M. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a minimum 2-year manufacturer's warranty, starting from the date of substantial completion.
- N. All actuators connected to all sequenced valves and dampers shall have independent control and adjustment from one another to emulate a pilot positioner.
- O. Acceptable Manufacturer's:
 - 1. TAC.
 - 2. Belimo.
 - 3. Johnson Controls, Inc.
 - 4. Siemens.
 - 5. Honeywell, Inc.

2.5 CURRENT SENSING STATUS RELAYS

- A. Provide current sensing status relays for motor operation status monitoring as specified elsewhere herein.
- B. Sensors shall be 100% solid state, no mechanical parts, and have no calibration drift.
- C. Sensors shall have an adjustable trip level, be isolated, have single set point adjustment, require no external power (power induced from conductor), and have integrated adjustable wall or floor mounting bracket.
- D. Sensors shall be suitable for motor loads from 0 to 100 HP, with a supply current of 1 ampere up to 135 amperes, 600 VAC RMS, setpoint adjustable to +/-1% range from 0-95% non-condensing relative humidity
- E. Sensors shall be as manufactured by Veris Industries, Inc.

2.6 FREEZESTATS

- A. Freezestats, for freeze protection, shall be capillary tube type with minimum 20 foot long sensing element, sensitive to the coldest temperature along any 12 inch long portion, to de-energize equipment on a drop in temperature below setpoint.
- B. Freezestats shall be field adjustable from a minimum of no lower than 35 Deg.F. up to 65 Deg.F. Standard setpoint shall be 40 Deg.F., unless noted otherwise. Provide dual temperature setpoint scale.
- C. Freezestats shall be manual reset, unless indicated otherwise, and be rated for 120 VAC, maximum 10.0 amperes. Provide one (1) normally - open and one (1) normally - closed contacts. Provide an additional set of dry contacts on each device for connection to a central control and monitoring system.
- D. Sensor and controller shall be able to operate in ambient conditions from 20 Deg.F. to 104 Deg.F. in a dust-proof and moisture-proof enclosure.
- E. Provide mounting bracket suitable for mounting on ductwork and the side of air handling equipment.

- F. Provide grommets for protection of capillary where inserted through drilled openings in equipment or ductwork.
- G. Provide capillary tube stand-off brackets suitable to hold sensing element off of water coil fins to secure element firmly in place, as well as to avoid close contact with coil tubes.
- H. Freezestats shall be as manufactured by Johnson Controls, Inc.; Honeywell, Inc.; Invensys; Siemens; or Robertshaw.

2.7 ROOM SENSOR AND THERMOSTAT PROTECTIVE COVERS

- A. Provide opaque Lexan thermostat guards with mounting brackets and tamper proof screws for each new wall mounted thermostat and sensor installed, unless indicated otherwise. Administrative office areas and classrooms shall not require guards. Generally, guards shall be provided in Institutional Public Use Areas such as Public Use Corridors. Provide wire type guards in Gymnasiums.
- B. Guards shall be sized to accommodate the thermostat or sensor to be enclosed, and include ventilation openings, ring base, and key lock.
- C. Guards shall be as manufactured by:
 - 1. Mason.
 - 2. Honeywell.
 - 3. Best Engineered Control Products.

2.8 AIR FLOW DIFFERENTIAL PRESSURE SWITCHES (HIGH/LOW PRESSURE)

- A. Air flow differential pressure switches shall be provided to monitor high or low static pressure in ductwork, where required elsewhere herein, and to detect clogged air filters, unless specified in other sections of these specifications.
- B. Switches shall be capable of operating in ambient temperatures from 0 Deg.F. to 165 Deg.F.
- C. Setpoints shall be field adjustable from 0.05 to 5.0 inches water column to suit the application. Provide concealed scale plate with adjusting screw for setpoint adjustment. Scale shall be selected such that the normal operating range is at the midpoint of the scale; i.e. an operating range of 0.30 to 0.70 needs a scale of 1.0.
- D. Materials of Construction:
 - 1. Buna-N Diaphragm
 - 2. Molded polycarbonate enclosure.
 - 3. Zinc plated cold rolled steel; 0.040 inches thick for diaphragm housing and 0.032 inches thick for cover material.
- E. Provide appropriate mounting brackets and any remote mounting probe kits as necessary for each particular mounting condition.
- F. Acceptable Manufacturers:
 - 1. Johnson Controls, Inc.
 - 2. Honeywell, Inc.
 - 3. Invensys.
 - 4. Siemens.
 - 5. Robertshaw.
 - 6. Dwyer.

2.9 LOCAL CONTROL PANELS

- A. New local equipment control panels shall be installed in each equipment room, or other locations as indicated or as required, for new electric equipment and control devices. They shall be totally enclosed, pre-piped, and wired to labeled terminals to house all associated controllers, thermometers, relays, switches, etc. serving that equipment. Provide one cabinet for each air handling unit or group of units in the same room.
- B. Panels shall be mounted at a convenient height for access. Acceptable locations include mechanical equipment rooms, storage closets, electrical rooms, or other spaces as indicated on the Drawings. Above ceiling locations are not acceptable.
- C. Thermometers, pilot light switches, and gauges shall be flush mounted on panel surface.
- D. Cabinet frames shall be extruded aluminum sections with riveted corners supported by internal angle brackets. Door shall have continuous hinged door, with latch and key lock.
- E. Sub-Panel and face panel shall be removable for ease of installation and replacement. Face panel shall be of a finished color with a finished frame.
- F. Knockouts for 1/2" x 3/4" EMT connection and 1-1/2" x 1-1/2" trough shall be provided at top and bottom of panel.
- G. Identify each panel, switch, and device by an engraved, bolt-on, black phenolic nameplate with white lettering securely attached. Identify all control devices inside panels similarly. Embossed plastic tape will not be acceptable on panel front faces but will be allowed on panel interiors.
- H. Switches and pilot lights shall be mounted on the panel face with all other devices mounted inside the panel. Devices inside panels shall be wired to numbered dual terminal strips.
- I. Start-Stop Pushbuttons and Pilot Lights, where called for, shall be of the low voltage and neon type. Pushbuttons shall be heavy duty type. Pilot lights shall be interlocked with starter auxiliary contacts except fans and pumps which shall have current sensing relays to indicate run status.
- J. Each new control panel installed shall have a minimum of 25% consolidated spare/extra space available inside the panel for mounting of control devices for future system modifications or changes. This space shall be indicated on the panel shop drawing.
- K. All wiring inside panels shall be concealed in a wiring harness.
- L. Permanently affix inside each panel a final "as-built" control drawing of the piping and wiring of the panel.
- M. All panels shall be factory assembled, piped and wired.

2.10 ENERGY MANAGEMENT SYSTEM

- A. The existing central EMS HARDWARE is located in the District Maintenance Facility and is intended to be reused.
- B. Network Level Controllers shall have a 16 bit based microprocessor with EPROM operating system. DDC programs and data files shall be in non-volatile EEPROM or flash memory to allow simple and reliable additions and changes. Each network controller shall have an on-board 30 day battery back-up realtime clock. Controllers shall be provided as required with capacity to accommodate input/output (I/O) points required for the application plus any spare points as specified. Each panel shall be provided with a socket for a Portable Operators Terminal (POT), and a port for network communications at no less than 78,000 baud. Controllers shall have outputs which shall

be binary for On-Off control, with true variable voltage (0-10v), for driving analog or pneumatic transducer devices. Analog outputs shall have a minimum incremental resolution of one percent of the operating range of the controlled device. Controllers shall have LEDs for continuous indication of all bus communications, power, and operational status. All panel electronics and associated equipment shall be installed in suitable enclosures.

- C. Terminal Equipment Controllers (TEC's) shall be UL916 standalone EEPROM based and configured to perform the sequences specified, and with I/O selected for the application. TEC enclosures shall be compact plastic conforming to UL94-5V or plated steel. Each TEC shall be provided with LED type annunciation to continually display its operational mode; power, normal, or in an alarm state. TEC networks operating on a 9000 baud rate shall be grouped with no more than 20 TEC's per primary bus connected device. For TEC networks operating over 50,000 baud, up to 100 TECs may be so grouped.

D. General:

1. Software development and programming shall be as directed by the Owner and as described herein. Contractor shall install all program operating time schedules as furnished by the Owner.
2. During construction, the Contractor may operate equipment in what is considered a Construction Schedule. The control systems installer, at Substantial Completion, shall remove such schedules and replace these with individual, independent, operating schedules for each system and individual piece of equipment, specifically air handling equipment.
3. Program trend logging of all analog and binary points of control at intervals as directed by the Owner, initially use fifteen (15) minutes.
4. Overall systems control shall be performed by a field programmable direct digital controller, microprocessor based, which incorporates Direct Digital Control, all necessary energy management functions and provides for digital display and convenient local adjustments of desired variations at each individual controller cabinet. This shall include scheduled programming and system interlocks.
5. DDC control units and all hardware shall be capable of continued operation at room temperatures of 40 Deg.F. to 120 Deg.F. and humidity from 10% up to a non-condensing point of 90%. All inputs shall be capable of withstanding continuous shorting to 120 VAC.
6. Provide any external electrical power supply protection devices to protect controllers from external voltage surges to include high voltage and lightning disturbances/protection.
7. Provide function switches in a local control panel, if not integral with the DDC controller, with "on-off" control and a "manual-auto" switch for each new DDC output (contact type) with switch status information being available to the central systems historical data files for all air handling equipment over 2000 CFM in capacity, pumps and controlled exhaust fans over 2000 CFM in capacity. Alternately, provide this capability integral with the Direct Digital Controllers. Terminal units such as small exhaust fans, small fan coil units, heat pumps, and rooftop A/C units are not required to have function switches. Switches shall be concealed within the local control panel or digital controller enclosure to be lockable. The network manager software shall identify points that are locally overridden and report by display to the building CPU to include generating a printout at the local or remote location printer.
8. Provide a hard wire connection between the Building LAN serving all new Controllers to the Central Facilities Energy Management System. Verify dependable utilization of this system and transfer of local system data and

functions to the existing control system CPU. General data reporting and alarms transmission shall be verified.

9. No PC shall be provided in the facility. A web-based browser software system, with server, shall be used to allow any authorized District employee the ability to access the Control System and operating parameters for monitoring and adjustment or for schedule changes. Maintenance Department may use this system, but will also use an Owner furnished laptop to plug into a communications jack located at control panels, wall mounted sensors, or DDC Controllers.
10. Web-based interface shall be used for digital parameter display, programmed to display analog variables, binary conditions, off normal scans and other analog or binary information required for analysis and adjustment of the system being controlled. Computer shall further contain display features to indicate automatic operation, manual or override operation, alarm indication, and other auxiliary displays associated with special purpose auxiliary function keys.
11. Energy Management System programs shall include, but not all are necessarily utilized, but shall not be limited to:
 - a. Optimal start-stop using an adaptive algorithm to prevent the need for manual adjustments of parameters.
 - b. Optimization programs controlling equipment using outdoor dry bulb and dew point temperatures. The outdoor wet bulb temperature shall be calculated by the following equation:

$$WB = (DB-DP)K+DP \text{ where } K = 0.560-0.0068 (DP-30)$$

E. Control:

1. Control algorithms shall be available and resident in the digital system controller to permit Proportional, Integral, and Derivative control modes in any combination to meet the needs of the application. Other control modes such as incremental, floating, or two-position must be available to adapt to job needs.
2. All control shall be performed in a digital manner using the digital signal from the microprocessor based controller converted through electronic circuitry for modulation of electric actuators.
3. Provide sensitivity adjustment for all DDC output control points.
4. The library of routines available in firmware must be capable of generating additional programs as may be required for specific client tailored requirements. The Owner shall be capable of revising programs without the aide of the installer.
5. Adjustments of all new control variables shall be conveniently available at any computer terminal that has the appropriate EMS software loaded onto it, through the use of the keyboard and display. The adjustments shall include, but not be limited to, proportional gain, integral rate, the velocity and acceleration constants associated with incremental control and on/off values of two-position control.

F. Field Programmable:

1. The local DDC controllers shall each contain all necessary mathematic, logic, utility functions; and all standard energy calculations and control functions in ROM to be available in any combination for field programming the unit. These routines shall include, but not be limited to:

- a. Math Routines:
 - 1) Basic Arithmetic
 - 2) Binary Logic
 - 3) Relational Logic
 - 4) Fixed Formulas for Psychometric Calculations
 - b. Utility Routines for:
 - 1) Process entry and exit
 - 2) Keyboard functions
 - 3) Variable adjustments and output
 - 4) Alarm Indication
 - 5) Restart
 - c. Control Routines for:
 - 1) Signal compensation
 - 2) Loop control
 - 3) Energy conservation
 - 4) Timed programming
- 2. Final field programs shall be stored in battery backed up RAM or in permanent memory.
- G. Expandability: The DDC shall be expandable by adding additional field interface units that operate through the central processor of the DDC. The processor in the DDC shall be able to manage remote field interface units thereby expanding its control loop and energy management point capacity. Remote units shall be able to stand alone and have two-way communication in a LAN configuration. Systems furnished shall be fully manufacturer supported and under current production.
- H. Calibration Compensation: To maintain long term analog accuracy to the controller sensing circuits, the DDC shall sense the voltage being supplied to the resistance sensing element and through firmware compensate for power supply changes due to long term drift or drift due to ambient temperature changes at the power supply.
- I. Battery Backup: New DDC system controllers shall be supplied with a minimum of 48 hours of nickel-cadmium battery backup, during power outages, for the RAM, with an automatic battery charger to maintain charge while power is on, to prevent internal component damage or failure. DDC modules shall have automatic restart capabilities with sequencing after a power failure without program interruption. This shall include the staggered restart of EMS controlled equipment in pre-selected load groups in 15-30 second intervals, adjustable, to minimize KW demand on restart of equipment after power is restored.
- J. Associated Hardware:
 - 1. All actuators for valves and dampers shall be supplied under this section of the specifications.
 - 2. Where modulating electric actuators are used they shall be compatible with the (pulse width modulated) output of the Digital System Controller.
- K. Diagnostics: The Digital System Controller shall contain in its program a self-test procedure for checking the digital controllers, and by means of a non-destructive memory, check the computer.
- L. Default Operating Procedure and Alarms:
 - 1. All variables shall be identified as being reliable or unreliable. When a calculation is required to use a value (sensed or calculated), which is identified

- as being unreliable, the unreliable data value will flash. The calculation will use a default value programmed into the unit.
2. All alarms (a pump that did not start, etc.) and all deviation alarms (temperature, off, normal, etc.) will locally display an alarm as well as report to the CPU the type of alarm, designate equipment or system effected, date and time of alarm. A hard copy printout of alarms shall be generated at the CPU location. A scan can then identify all alarm conditions and their identifier.
- M. Cabinet:
1. The DDC modules shall be enclosed in a metal frame cabinet. The cabinet shall be constructed such that it can be mounted and electrical terminations can be made during the construction phase of the project. The DDC electronics are to be removed and added at a later date, only prior to start-up.
 2. Cabinet shall be installed on the wall in the Mechanical Rooms or elsewhere as indicated.
 3. DDC cabinets shall be provided with a key lock. All cabinets on each installation shall utilize one master key.
 4. All control wiring and system communications shall be electrically terminated inside DDC cabinets.
- N. U. L. Approval: The DDC system panels shall be an approved U.L. System, with U. L. listing as a Signaling System.
- O. General software features of the web controller and field controllers, with sufficient internal memory, shall include the following as a minimum (although not all are necessarily used):
1. Start-Stop Functions
 2. Optimized Start-Stop Control (warm-up and cool-down)
 3. Time Programmed Commands
 - a. Normal occupancy
 - b. Holiday
 - c. Occupancy overrides
 - d. Schedules shall be programmable up to one year in advance with system wide or global scheduling and local, point by point scheduling.
 4. Duty Cycle Control
 5. Night Setback/Setup
 6. Electric Demand Limiting
 7. Override Feature
 8. Run Time Totalization with data in non-volatile module memory.
- Provisions shall be made for on-line programming and override.
- P. On/Off Points of System Control shall be provided for the following:
1. Each split DX AC Unit: Refer to Drawings for quantities and sizes.
 2. Lighting controls (Refer to Electrical Drawings for lighting control interface):
 3. Exhaust fans:
 - a. Restrooms, Custodial and Locker Room
 - b. Electrical Room
 - c. Storage Rm.
- Q. Run Status (On/Off) of all units indicated above shall also be provided and shall be capable of being accessed for on-line programming. Status shall be by means of the local motor controller through the use of adjustable current sensing relays, using a current sensing relay on the evaporator fan motor for status on all A/C units, and other

EMS controlled fan for other air and fluid handling equipment. Coordinate with control equipment furnished.

- R. Failure Alarm Status for the following EMS controlled items shall be provided through the EMS:
1. Combined Safety Alarm, one (1) for Split DX AC Unit and EMS controlled exhaust fan.
 2. Low/High Temperature Alarms for each temperature sensor installed, four (4) Deg.F. above or below setpoint, adjustable.
 3. High Relative Humidity Alarm for each space relative humidity sensor installed; on a rise above 65% R.H., adjustable.
 4. Emergency overflow Condensate Pan (all Split DX A/C equipment) Moisture Detection/High Water Level Alarm: De-energize unit served and send alarms to the EMS.
 5. Polar ionizer failure alarm for each polar ionizer installed.
- S. Provide cumulative run time logging and indication for equipment noted in Paragraph "P", above.
- T. Provide analog indication for the following:
1. For each Split Direct Expansion (DX) A/C Unit:
 - a. Space temperature, Deg.F.
 - b. Supply air temperature, Deg.F.
 - c. Mixed air temperature, Deg F.
 2. For Computer Room AC Units (CRAC) Units:
 - a. Space temperature, Deg. F.
 - b. Space humidity, % RH.
 3. Provide indication of outside air temperature in Deg.F for this building.
 4. Provide indication of outside air relative humidity level in % RH for this building.
 5. Provide indication of outside air carbon dioxide in PPM for this Building.
 6. Space Temperature, Degrees F.:
 - a. Electrical Room.
 - b. IDF Room.
 7. Provide indication of space relative humidity level in % RH for the following spaces:
 - a. Assembly area.
- U. Building Computer Software Management features
1. Provide minimum of 15 User Selectable Passwords with a minimum of three levels of access. Highest level provides system access, secondary level provides access for command to field devices only, lowest level provides monitoring capabilities only with no field control allowed. Password access will be logged with time/date stamp and associated user ID.
 2. Provide a minimum of 16 Point Group Summaries with each point inclusion selectable by system operator. Summaries will have a minimum of six (6) character identifiers for each group. A separately selectable All Points Summary shall be available to the operator for a view of the complete system. Alarm Summaries, listing all points in an alarm status shall be provided, and shall be Owner definable.

3. Trend logs and summaries:
 - a. The Central Computer Workstation (CPU), shall be provided with, as a part of this contract, the ability to periodically trend any hardware, software, or simulated point within any of the attached DDC panels, for this project, at an Owner selectable interval of a minimum of once per second, up to at least once per 1000 minutes.
 - b. The trending programming for selected points and all feature attributes of these points shall be accomplished online at the CPU with no disruption of dynamic communication with the remote DDC panels. The operator shall be able to add, delete, and modify points and attributes at any time while online. Online programmable attributes shall include:
 - 1) Point addition, deletion, and modification
 - 2) Sampling intervals and ranges
 - 3) Historical samples to be stored per individual point
 - 4) Dynamic data values
 - 5) Engineering units of each point
4. Online editing capabilities shall be provided for, but not limited to the following:
 - a. Add/Delete Points
 - b. Modify Engineering Units
 - c. Modify/Create Point Groups
 - d. Adjust Set Points
 - e. Adjust Individual Start/Stop Times
 - f. Trend Selected Points
 - g. Observe Any System Point, Hardware, or Software

This editing capability shall be for both CPU resident programs and remote DDC panel programs.
5. English language shall be used for all inputs, outputs, and display. Code or computer language will not be acceptable.
6. Remote DDC Field Communication: Communication between the Central Computer Workstation and the remote DDC panels shall be achieved via digital transmission utilizing a distributed polling technique for recognition of all field points, both software and hardware points status, issuing of commands, programming of DDC units, etc. Additionally provide software for the existing Central Computer to allow the same interaction/communication features as noted for the Computer Workstation Building. Data transmission shall be via hardware connection compatible with electric category Type 3002, as described in Bell System Technical Publications for Data Transmission using 9600 Baud Rate.
7. New field panels/controllers shall be able to communicate with the existing front end system same as currently exists.
8. CRT Format:
 - a. The CPU CRT format shall include and display in an individually dedicated and protected area of the viewing screen the following Dynamic information:
 - 1) The current time, date, and day of week (including Holidays).
 - 2) Sequential as occurred alarms.
 - 3) Visual indication of alarm or off normal conditions which are active.
 - 4) Current operator identification.

- 5) Operator work area to display various forms of point information issue commands, and data base information relevant to current activities.
 - b. Operator will have full access to the system for issuing commands, etc. while this display is active.
 - c. Provide a graphic software package and programming to result in a schematic illustration for each controlled piece or group of pieces, of equipment to illustrate all related controlled variables, setpoints and operating parameters. Additionally provide a building floor plan with room numbers and locations of all space sensors and controlled equipment. The user shall be able to click on any feature to pull up related system graphics.
9. Provide a building floor plan with room numbers and locations of all space sensors and controlled equipment for display on the Central workstation. The user shall be able to click onto any feature to pull up related system graphics.
- a. The graphics pages, sequence of windows (pages), shall all be formatted similar to other recently completed projects in the district.
 - b. The room names, as applicable, and room numbers shall match those that exist in each building. Plan sheet room numbers shall not be used. Provide training to the Owner to allow them to change room numbers displayed (which shall be easily made by technicians with little EMS experience).

2.11 DDC SYSTEM GRAPHICS

A. Graphic Requirements:

1. Graphic Pages:
 - a. Hierachy:
 - 1) The organization of graphic pages shall be from a global level down to a very detailed level through a series of links.
 - 2) Linking shall allow the operator to move down the hierarchy, up the hierarchy and laterally within the hierarchy.
 - b. Hierarchy Outline:
 - 1) Site Plan Page: A visual representation of the site (map). One page or multiple linked pages depending on the size of the site plan.
 - a) Link to individual building graphic pages.
 - b) Display outdoor weather conditions.
 - 2) Utility Management Page: A summary of data on the utility consumption for the site.
 - a) Link up to the site plan.
 - b) Display:
 - (1) Utility consumption data.
 - (2) Demand data.
 - (3) Voltages, currents and power factors.
 - (4) Demand control actions currently in effect.
 - c) Presenting the utility management data may require more than one graphic page to effectively report the data from multiple meters.

- 3) Building Graphic Page: Typically a picture of the building. One page per building.
 - a) Link to floor plans within building.
 - b) Link to central plant graphics where the plant serves the entire building.
 - c) Link to delivery systems if the delivery system serves the entire building.
 - d) Link up to the site plan.
- 4) Floor Plan Page: This will be a two dimensional plan of a floor area. A minimum of one page per floor per building is required. Where floor plans are large, multiple linked pages are required. For each control zone the value of the controlled parameters shall be displayed. This will typically be lighting status, temperature and relative humidity if relative humidity is a controlled variable.
 - a) Link up to the Building page.
 - b) Link up to the Site Plan page.
 - c) Link to any delivery system that serves the floor plan area (air handling unit is typical).
 - d) Link to time schedule that affect the systems that serve the area.
 - e) Link to Terminal Unit Summary page where multiple zones on the floor are served by unitary control devices.
 - f) Individual control zones shall be identified.
 - g) The location of terminal equipment serving each zone shall be shown.
 - h) The location of sensors installed in the occupied space shall be shown.
 - i) Where room numbers are available, they shall be shown. Revise room numbers in graphics to match the actual room numbers selected and installed in the facility; if not matched to construction drawing room numbers.
- 5) Delivery System Page: A graphical representation of an air delivery system such as a D/X air handling unit, 100% outside air unit. One page for each delivery system.
 - a) If the Delivery System serves a specific floor area, link up to the Floor Area page.
 - b) Link up to the Building page.
 - c) Link up to the Site Plan page.
 - d) If the Delivery System supplies multiple terminal devices, link to a Terminal Unit Summary page.
 - e) Link to a Delivery System Configuration page.
 - f) The graphical representation of the equipment shall be 3-dimensional and represent the true physical characteristics of the installed system.
 - g) Display:
 - (1) Process variables.
 - (2) Commands to end devices.
 - (3) Status of end devices.
 - (4) Status of different modes (economizer on/off, mechanical cooling enabled/disabled, occupied/unoccupied).
 - (5) Alarm points.

- h) Link to any time schedules that affect the system operation.
- i) Link to any pre-configured trend charts for the system.
- 6) Delivery System Configuration Page: On this page the operator is given access to the configuration parameters for the delivery system. Typically, this page presents data in a tabular format. The type of data on this page is not changed frequently, but the operator may wish to view it frequently. One page per delivery system is required.
 - a) Display.
 - (1) Set Points.
 - (2) Turning Parameters.
 - (3) Calibration Parameters.
 - (4) Timing Parameters.
 - (5) Application Parameters.
 - (6) Reset Schedules
 - (7) Lead Lag Information.
 - (8) Time Schedules.
 - b) Link up to the Delivery System page.
 - c) Link up to the Building page.
 - d) Link up to the Site Plan page.
- 7) Terminal Equipment Summary Page: On this page the dynamic data and set points that are associated with multiple terminal units are presented in a tabular format. The objective is to present a summary of terminal unit performance for an area of the facility. One page is required for each group of terminal units. In the tabular data, do not use less than 12 pt. font size. Multiple linked pages may be used if there are a large number of terminals served by one delivery system.
 - a) Display in the table:
 - (1) Process variables.
 - (2) Set points for each process.
 - (3) Command to each end device.
 - (4) Status of each end device.
 - b) Link to the page for each Terminal Unit.
 - c) Link up to the Delivery System page.
 - d) Link up to the Floor Plan page.
 - e) Link up to the Building page.
 - f) Link up to the Site Plan page.
- 8) Terminal Unit Page: A graphical representation of a terminal unit such as a D A/C unit and 100% outside air unit. One page for each terminal unit.
 - a) Link up to the Terminal Summary page.
 - b) Link up to the Floor Plan page.
 - c) Link up to the Building page.
 - d) Link up to the Site Plan page.
 - e) The graphic representation of the equipment shall be 3-dimensional and shall represent the actual installed terminal unit.
 - f) Display:
 - (1) Process variables.
 - (2) Command to end devices.

- (3) Status of end devices.
 - (4) Set points for each process.
 - (5) Modes (auto, heat, cool, etc.).
 - (6) Capacity indicators (terminal load, % heat, % cool, etc.).
 - (7) Reset schedules.
 - (8) Occupancy commands and status.
 - (9) Alarm points.
 - c. For all points on a graphic page that are subject to being under manual or test mode, the display shall indicate when test mode or manual mode has been applied to the point.
 - d. Graphic Page Requirements:
 - 1) The sequence of control defines the buildings and all of the equipment items for which graphic pages shall be constructed as described above.
 - 2) The Contractor shall develop similar additional graphic pages to be defined during the construction period as follows:
 - a) Up to five additional pages per building.
 - b) Up to twenty additional global pages.
- 2. User Groups:
 - a. The Contractor shall configure four user groups, one for each level of security. The group names shall be representative of the "names" below:
 - 1) Administrators.
 - 2) Engineers.
 - 3) Operators.
 - 4) Viewers.
- 3. Users:
 - a. The Contractor shall configure two users in each group. The name and passwords shall be representative of the "names" below:
 - 1) Administrators Group:
 - a) Admin1 / Admin1
 - b) Admin2 / Admin2
 - 2) Engineers Group:
 - a) Engr1 / Engr1
 - b) Engr2 / Engr2
 - 3) Operators Group
 - a) Oper1 / Oper1
 - b) Oper2 / Oper2
 - 4) Viewers Group
 - a) View1 / View1
 - b) View2 / View2
 - b. With the exception of the Viewers Group, these users shall not be added to the system until all testing has been completed and the system has been accepted. The Contractor shall accept all responsibility for actions the result from the unauthorized issuance of user names and passwords above the level of viewers prior to system acceptance unless specifically instructed to do so in writing by the Owner.

4. Alarm Processing:
 - a. All alarms required by the sequence of control shall be fully configured for delivery to the operator workstations and the alarm files.
 - b. A common alarm file shall be established to receive alarms from all of the field devices.
 - c. A separate alarm file shall be established on a per building basis to receive just the alarms from that building.
 - d. The alarm messages shall be descriptive and include as a minimum:
 - 1) System identification.
 - 2) Date.
 - 3) Time to the second.
 - 4) Nature of the alarm such as high value, low value, or fail to start.
 - e. The system shall be configured to send an alarm message on return to normal.
 - f. All users shall receive all alarms.
5. Reports:
 - a. The sequence of control includes the requirements for variables to be trended. The data server is setup to collect all of this data. The operators have the ability to look at the historical trend data on a log basis or in a graphical format as needed. It can be very beneficial to the owner for performance assessments or energy management to have a set of standard reports that analyzes the data and puts it in a format to drive management decisions. Typical examples are:
 - 1) Run time reports on equipment.
 - 2) Performance deviation reports that compare actual performance with specified performance. An example would be the average deviation from set point for space temperature, discharge air temperatures on air handling units, etc.
 - 3) Equipment efficiency reports such as measurements of the KW per TON for a chiller over time.
 - b. In this section of the specification, a description of the reports to be prepared should be described. The contractor is best qualified to set these reports up during construction rather than leave this responsibility to the owner after acceptance.

2.12 WEB BROWSER INTERFACE (EXISTING TO BE REUSED OR NEW)

- A. Provide Internet/Intranet Connectivity utilizing a Web Browser as follows:
 1. Shall be a "Server" based product that provides browser access to Ethernet enabled automation controllers. Access is accomplished by utilizing standard internet search browser. No other "client" side software shall be necessary to view and utilize the system. The "Server" hosting the Web Application can be located anywhere on the Internet. The software functions by taking real-time data from the active automation systems and combining that information with the appropriate graphic file in an HTML format to be viewed by the web browser. The number of simultaneous users connected to the web application shall only be limited by the capability of the server hosting the application. The application should be able to service multiple sites.
 2. The graphics utilized for this system shall not require external applications to convert the images for use between the web server-based application and the

- traditional graphical user interface. Graphics shall be interchangeable between applications.
3. Web Browser Server shall receive server-based software which shall support Microsoft's .NET standards for the exchange and interoperability of information and data.
 4. Server-based software upgrades shall be free to the owner for up to five (5) years after Substantial Completion.
- B. The Server (existing) shall be reused.
- C. The Web Browser Interface shall include the following user configuration requirements:
1. Usernames and passwords can be setup via the Web Browser Interface. Physical access to the server is not required but will be password protected.
 - a. Individual user names/passwords are to be utilized.
 - b. Usernames/passwords can be specifically unique to allow the user to be automatically redirected to a specific site, and or graphic display when logging into the system.
 2. Passwords can be configured to allow the user to modify setpoints or not.
 3. All user configuration functions shall be provided through an intuitive graphical user interface.
 4. Web Browser Interface shall not require any external applications, "Client Side" software or "Plug-Ins" to connect, view, or control any aspect of the building automation system.
 5. Access to the installed automation system shall be performed through Microsoft Internet Explorer.
- D. Site Graphics shall meet the following requirements:
1. Graphics displayed through the Web Browser Interface must be the same graphic images provided through the Graphical User Interface described above. No external applications are to be required to interchange graphic images between the web server application and the graphical user interface.
 2. Trend data must be able to be displayed graphically and in "spread sheet" format without the addition of any additional client-side software, plug-Ins, or additional applications. Digital Start/Stop Logging shall be able to be displayed and printed from the browser interface without the addition of any additional "client side" software, plug-Ins, or additional applications.
 3. The display and printing of alarm data shall be performed without the addition of any "client side" software, plug-Ins, or additional applications.
 4. Points that are manually overridden shall be displayed on the graphic screen by an icon adjacent to the overridden point to provide a quick visual indication of any points on the screen that are overridden.
 5. The viewing and modification of weekly schedules shall be performed in a graphically intuitive manner that is consistent with the non-Web Enabled application. This shall be performed without the addition of any "client side" software, plug-Ins, or additional applications.
 6. The viewing and modification of annual holiday schedules shall be performed in a graphically intuitive manner that is consistent with the non-Web Enabled application. This shall be performed without the addition of any "client side" software, plug-Ins, or additional applications.
 7. "Right clicking" on the point and modifying the value shall perform the editing of point values.
 8. Points can be placed in "manual" or "automatic" mode from the Web Browser, providing password restrictions for the user allow such functionality.

2.13 ELECTRICAL WIRING

- A. All low (under 120 volt) and medium (120 volt and higher) voltage wire, wiring, and conduit required for the operation of the control system shall be the responsibility of this section of the specifications and shall be installed as described and in full accordance with the requirements of Division 26 of these Specifications.
- B. The control manufacturer shall be responsible for supplying complete and approved wiring diagrams and installation supervision of the wiring of the control system and shall perform all necessary set-up and calibration labor.
- C. Starters, furnished in other sections of these specifications, shall be installed under Division 26, but all wiring from auxiliary contacts or relays shall be under this section of the specifications.
- D. All wiring, including Class 2 signal wiring, shall be installed as a Class 1 electrical system as defined by the National Electrical Code (NEC).
- E. All control conduits with #8 conductor or smaller (cross-sectional area) shall have one (1) spare conductor each run in conduits carrying 5 or more conductors. Spare conductor shall be same size as the majority of conductors sized in the conduit. Conduits with 9 or more conductors shall have two spare conductors. Terminate spare conductors at control panels in an acceptable manner and tag wires as "spare".
- F. The electrician shall be licensed by the City and local authorities having jurisdiction over the area in which the work is to be performed.
- G. All class 1 control wiring conduit shall be run with not more than 30% fill based on inside conduit diameters and cross-sectional area. This provision is for future modifications or additions to the control system.
- H. All conduit carrying shielded twisted pair cabling, communication, or signal, Class 2 wiring, shall be sized for a maximum of 40% fill based on inside conduit diameter and cross-sectional area. This provision is for future modifications or additions to the control system.
- I. All wiring shall be run in conduit. All Class 1 power wiring shall be run in conduit. All Class 2 signal wiring, low voltage control type, shall be run in conduit. No exposed wiring of any kind will be allowed. Class 2 signal wiring may be installed above accessible lay-in ceilings only if run-in plenum rated cable supported independently from structure and run parallel and perpendicular to the structure.
- J. All conduit shall be 3/4 inch size minimum, except raceways terminating at control devices manufactured with 1/2" knock-outs, i.e., conduit from junction box to smoke or fire detectors (local single device wiring only).
- K. Electrical Systems Installer on project may perform temperature control conduit and wiring installation on project only that this portion of work shall be bid directly to the Temperature Control Systems Installer, and all work in relation to temperature control wiring shall be done subordinate to this Section of the Specifications. Wiring terminations shall be under this Section of the specifications.
- L. Under this Section of Specifications, furnish and install, at an early stage of construction (when walls are being constructed) galvanized steel back boxes for all wall mount space sensors, suitably secured with 3/4" EMT routed to four inches (4") above an accessible ceiling. Install with pull wire for installation of sensors and related wiring at a later stage of construction. For existing construction, either fish flexible conduit down accessible walls, use surface mounted wiremold components on masonry walls (color to be approved by Architect) in finished areas, or use surface mounted EMT in unfinished areas.

- M. Work Not Included Under this Section of Specifications: The Electrical Systems Installer shall provide:
1. Branch circuit and motor feeder circuit conductors, raceway, connections, and overcurrent protection for each motor or item of equipment furnished by the Owner or other Contractors.
 2. Installation of motor controllers furnished by the Owner or other Contractors, along with branch circuit and motor feeder circuit conductors, raceway, and connections in accordance with the manufacturer's approved wiring diagrams.
 3. Disconnect switches, where indicated on the drawings or required by codes, except as provided as an integral part of manufactured equipment.
 4. Power supply conductors, raceway, connections, and over-current protection for input power to HVAC Temperature Controls, HVAC Automation, and HVAC Energy Management Systems in accordance with approved rough-in and connection diagrams furnished by the system suppliers only when shown on Division 26 Drawings.
 5. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to ensure that all work is contained within the General Contract. The Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.
 6. Nothing herein shall be construed to confine the Contractor from assigning the work to any single member or group of systems installers deemed best suited for executing the work to effect completion of the contract. Refer to specific bidding instructions of the General Contract for the actual division of the work.
- N. Work Included Under this Section of the Specifications: The Mechanical Systems Installer shall provide:
1. Motors and equipment, erected in place and ready for final connection of power supply wiring, along with manufacturer's approved wiring diagrams.
 2. Motor controllers, in suitable enclosures and of the type and size in accordance with the manufacturer's recommendations and NEMA requirements, along with properly sized overload elements or devices which are normally provided as part of manufactured equipment.
 3. Disconnecting switches or devices which are normally provided as a part of manufactured equipment.
 4. Rough-in and connection diagrams for input power supply and connections for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems.
 5. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to ensure that all work is contained within the General Contract. The Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.
- O. Contractor, under this section of the Specifications, shall insure the furnishing and installation of:
1. All new branch circuit wiring, conduits, protective devices and accessories for power wiring to serve new control panels, control transformers, electric control dampers and valve actuators, combination fire-smoke dampers and any other control system power requirements where not shown to be performed by others. Field verify spare electrical circuits available where applicable. Do not tap into existing branch circuits without approval by the Owners Representative. Run all new circuits back to electrical feeder panels.

2. Conductors and raceways for the HVAC temperature control, HVAC automation, and HVAC Energy Management System in accordance with approved rough-in and connection diagrams furnished by the system suppliers.
 3. Termination of all conductors, raceways, devices, and connections for low voltage systems for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems in accordance with the provisions of Division 26, and approved systems shop drawings to provide complete operating systems in accordance with the functional requirements of the specifications.
- P. Wire all safety devices in series to include freezestats, and static pressure high limit controls; any single device when tripped, shall de-energize air handling equipment.
- Q. Wiring Requirements shall also include the following:
1. The conduit/wiring system required for the Temperature Controls and Energy Management System shall be a complete, separate, independent system. Conduit sharing with other unrelated electrical systems is not permitted.
 2. All wiring shall be labeled at both ends and at any spliced joint in between. Wire and tubing shall be tagged using 3M, Scotch Code Write On Wire Marker Tape Identification System; product number SWD-R-11954 with 3/4" x 5/16" write-on area or SLW 12177 with 1" x 3/4" write-on area and with 3M Scotch Code SMP Marking Pen. In addition to tagging at field device end and at spliced joints, a tag shall be placed 6" after entering each DDC panel. Identification and tag information shall be included in engineering/wiring submittal which must be submitted for Owner approval prior to beginning work. Tag information shall coincide with equipment/point information as written in the specification Input/Output summary.
 3. Digital Input (D.I.) wiring (Class 2) may be run in a common conduit with Digital Output (D.O.) Wiring (Class 1) where local codes permit.
 4. Analog Input (A.I.), Analog Output (A.O.), Digital Input (D.I.), and Network Communications Trunk (N.C.T.) wiring may be run in a common conduit.
 5. Digital Output (D.O.) wiring run in a common conduit with Analog Input (A.I.), Analog Output (A.O.), or Network Communication Trunk (N.C.T.) is not permitted under any circumstances.
 6. AC line power to DDC panel shall be #12 THHN.
 7. Digital Output (D.O.) wiring shall be #14 THHN.
 8. Digital Input (D.I.), Analog Input 4-20 mA (A.I.) and Analog Output (A.O.) wiring shall be #18 TSP (twisted shielded stranded pair with drain wire).
 9. Analog Input or voltage types (A.I.) wiring shall be #18 TSP (twisted shielded stranded pair with drain wire).

2.14 GENERAL

- A. System shall be installed complete with DDC panels, remote panels, thermostats, sensors, control valves, control dampers, all actuators, switches, relays, alarms, etc., and control piping in accordance with the extent of the sequences of operation. Provide all auxiliary equipment required. All controls shall be installed under this section of work.
- B. Control Systems manufacturer shall submit a complete and final check list verifying final calibration and set points for each system prior to final construction review.
- C. Complete control drawings shall be submitted for approval before field installation is started. The submittals shall give a complete description of all control devices and show schematic piping and wiring, as well as a written sequence for each operation.

- D. All control dampers shall be furnished by Control manufacturer and shall be set in place, under other sections of the specifications, and be adjusted for proper operation, including the installation of necessary linkages with actuators under this section of specifications. Contractor shall also furnish, under other sections of the specifications, install any necessary blank-off plates required to fill duct when damper size is smaller than the duct. All outside and relief air damper frames and blank-off plates shall be caulked air tight with non-hardening silicone caulking to the ductwork or frame opening.
- E. Work under this section shall regulate and adjust the control system, including all controllers, thermostats, relays, control valves, motors, and other equipment provided under this contract. They shall be placed in complete operating condition subject to the approval of the TAB firm. Contractor shall cooperate fully with the balancing agency in the testing, check-out and adjustment of the various systems. Contractor, under other sections of these specifications, shall install all wells, valves, and automatic dampers.
- F. Control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from the date of "Substantial Completion", any of the equipment herein described is proven to be defective in workmanship or material (except electrical wiring done by others), it shall be adjusted, repaired, or replaced free of charge.

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION – SPLIT DX AC UNITS WITH ELECTRIC HEAT

- A. The direct digital control system shall monitor and control each heat pump A/C unit. An electronic room temperature sensor shall, through a local terminal unit DDC Controller, one per unit, control its DX Cooling (minimum 1-stage for all units), and multi-stage electric heater to provide the following sequences:
 - 1. The DDC controller shall be of the automatic change-over type to provide for a heating and a cooling set point to be software interlocked to prevent the cooling set point from being set below the heating set point and vice-versa. Provide for a minimum 2 Deg.F. dead band between set points, adjustable up to 5 Deg.F.
 - 2. Include optimized start and stop features for unit control where the space temperature is compared to the ambient outdoor air temperature to calculate the minimum run time necessary to attain the normal mode set point by the occupied time scheduled.
 - 3. Upon a need for mechanical cooling, the DX cooling system shall be energized in such a manner as to maintain a stable space temperature set point of 72 Deg.F (adj.). On a rise above set point the 1st stage of cooling, first compressor, shall be energized. For multi-stage units the additional compressor or stage will only be energized upon a further rise above set point and when the previous compressor or stage has been on longer than 5 minutes, adjustable. On a decrease in demand for cooling the compressors or stages shall be cycled off in reverse order to being energized. On a further decrease in space temperature, the first stage compressor shall be cycled off. Each stage of cooling shall have a minimum off time of approximately 5 minutes (Variable as determined through PID loop control).
 - 4. The heating temperature set point shall be 72 Deg. F., adjustable. On a drop below set point the 1st stage of heating, electric heating coil, shall be energized. For multi-stage units the additional stage will only be energized upon a further drop below set point and when the previous stage has been on longer than 5 minutes, adjustable. On a decrease in demand for heating the heating coil stages shall be cycled off in reverse order to being energized. On a further increase in space temperature, the first stage heat shall be cycled off. Each

stage of heating shall have a minimum off time of approximately 5 minutes (Variable as determined through PID loop control).

5. Space temperature sensors will also be used to operate the units in the unoccupied modes of operation.
 6. During the optimized start morning "warm-up" mode (winter), the air unit fan motor will be cycled on and the unit furnace will be energized, as required, to bring space temperature to the normal heating set point. During this mode the outdoor air damper will be closed. When the space reaches warm-up set point, one (1) Deg.F. below the heating set point, the unit will then be allowed to operate in the "occupied" mode. Warm-up shall occur not more than once each day. The discharge air temperature high limit control sequence shall remain in control during the morning warm-up mode.
 7. During the optimized start morning cool-down (summer) mode, the air unit fan motor will be cycled on and the unit cooling system will operate at the capacity as required to bring the space temperature to the normal cooling set point. When the space reaches cool-down set point, one (1) Deg.F. higher than the cooling set point, the unit will operate in the occupied mode and the space temperature sensor will control as described above. Cool-down shall occur not more than once each day.
 8. During the night set-forward and night set-back modes the equipment will be cycled as required to maintain those set points; on at 85 Deg.F. and off at 80 Deg. F., adjustable, for set-forward and on at 55 Deg.F. and off at 60 Deg.F., adjustable, for night set-back. The discharge air temperature high limit control sequence shall remain in control during the night set-back mode.
 9. For all units, the compressors shall cycle on and off in sequence with the supply fan to maintain set point. The supply fan shall not be operated without a compressor operating.
- B. For each AC unit, furnish and install a condensate overflow pan water detection, or float switch in the P-trap of the units, which shall de-energize the unit and send an alarm to the EMS when high water level is detected.

3.2 ELECTRIC UNIT HEATERS

- A. Electric unit heaters shall be controlled by manufacturer furnished thermostats set at 68 Deg.F. (adjustable). On a fall in temperature below 68 Deg.F., the unit heaters shall be energized. On a 2 Deg.F., adjustable, rise above set point, the heater will be de-energized.
- B. Mount thermostats, under this Section of Specifications, on wall where indicated on the Drawings.

3.3 SEQUENCE OF OPERATION - EXHAUST AIR FANS

- A. Install fan speed control switches at a convenient location on direct drive fans on the load side of the disconnect. Refer to equipment schedules on the Drawings for direct drive fan designation. Fan speed controllers are furnished with the fans as specified under other Sections of these Specifications.
- B. Where fans are designated to be thermostatically controlled on a rise in space temperature above 78 Deg.F., the respective fan controlled shall be energized. When a fan is energized, the respective make-up air dampers. Where indicated on the Drawings, shall be opened. On a fall in temperature to 75 Deg.F., the fan shall stop, and interlocked dampers shall be closed. Where fans are to be interlocked dampers shall be closed. Where fans are to be interlocked with heaters serving the same space, coordinate the

furnishing of combination heating-cooling thermostats (individual thermostats for the fan and heater not allowed) such that heating and cooling cannot occur simultaneously.

- C. Interlock small exhaust fans where the fan voltage is 120 volt, with the wall switch lights, when the voltage of the two match and where scheduled on the Drawings under this Section of these Specifications, unless shown to be performed on the Electrical Drawings of Division 26.
- D. Other exhaust fans shall be interlocked, be provided with locally manually controlled motor rated toggle switches with pilot lights where manual switches are scheduled and where specified in other sections of these specifications.
- E. EMS controlled fans shall run continuously during normal occupied mode and be de-energized during all other modes of operation.

3.4 SEQUENCE OF OPERATION – TECH. ROOM SPLIT DIRECT EXPANSION (DX) AIR CONDITIONING UNIT

- A. Wall mounted and discharge air temperature sensors shall be provided and installed under this section of specifications for monitoring and alarm purposes only.
- B. A unit manufacturer furnished thermostat, furnished under other Sections of these Specifications, shall be installed under this Section of Specifications. The cooling set point shall be 72 Deg. F., adjustable. On a rise in space temperature above set point, energize the cooling system. On a 1-2 Deg.F., adj., drop below cooling set point, the system shall either be de-energized or shall stage to first stage compressor and the re-heat coil shall be activated.
- C. For each suspended (above ceiling) AC unit, furnish and install a condensate overflow pan water detection, or float switch, which shall de-energize the unit and send an alarm to the EMS when water is detected in the pan.
- D. Provide for EMS monitoring of the space temperature and humidity for this room.

3.5 SEQUENCE OF OPERATION - NIGHT SET-BACK

- A. A night set-back mode shall be provided to keep equipment from operating except as needed to heat the space to protect the building systems from freezing and potential water damage.
- B. Designate one space temperature sensor in the building, to be located on an interior partition within 8 feet of a Northern exposure, selection as recommended by the balancing agency, to be used for night set-back control. Sensor, adjustable, shall be set for 55 Deg.F.
- C. Below set-back setpoint, respective air handling equipment shall receive a control signal, fans shall be energized, and related respective pump(s) shall be started if not already energized.
- D. Lockout cooling, ventilation cycles, morning warm-up and cool-down modes, night set-up mode, close all outside and relief air dampers.

3.6 SEQUENCE OF OPERATION - MORNING WARM-UP MODE

- A. A warm-up mode shall be provided to warm the building, or area served by a system, to within 1 Deg.F. of the normal occupied heating setpoint, adjustable, through the building Energy Management System optimized start feature.
- B. Warm-up shall function the same as night setback, except the setpoint shall be as noted above.

- C. Lockout the warm-up mode after the cycle is completed until the following scheduled cycle, generally not to occur more than once per day.
- D. Lockout cooling system, ventilation cycles, night set-back, morning cool-down, night set-up, close all outside and relief air dampers.

3.7 ELECTRICAL INTERLOCKS

- A. Certain electrical interlocks shall be as listed herein and in other sections of these specifications.
- B. All electrical interlocks shall be made by means of auxiliary contacts on motor starters or shall be accomplished with separate relays unless indicated otherwise. No motor power lead shall be utilized in an interlock circuit, unless indicated otherwise. Each separate control power lead serving a starter shall be provided with a disconnecting switch suitably identified and housed, which may be a toggle switch or other suitable disconnecting device, of proper capacity and number of poles.

3.8 DDC CONTROL

- A. Provide complete DDC Control for all equipment as indicated elsewhere herein.
- B. Not more than one local unitary direct digital controller shall be utilized per AHU/piece of equipment.
- C. Separate monitoring only control points not associated with specific pieces of equipment and which are global in nature are desired to be grouped together in a separate controller, or controllers, other than dedicated equipment controllers.
- D. Each DDC controller used as the main building network controller shall have its own real time clock.

END OF SECTION

SECTION 23 2113

HYDRONIC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 SYSTEM DESCRIPTION

- A. Furnish and install all piping of every kind required, specified, or shown on the Drawings for the installation of the work specified in Division 23. The location, direction, and size of the various lines are indicated on the Drawings. Lines for pilot and controls and instrumentation are not shown but shall be installed as required and as specified.
- B. Piping systems shall include all appurtenances shown on the drawings and specified herein.
- C. The work shall include the furnishing and installing of all supporting structures and members for pipes, ducts, and equipment.
- D. Support devices and members shall include vibration and noise isolating devices and assemblies. Penetrations of walls to structure shall be sealed off to limit noise transmission through sleeves.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality.
- B. All equipment and materials shall be installed by experienced mechanics certified and trained for the work performed.

1.4 SUBMITTALS

- A. Product Data: Submit complete manufacturer's descriptive literature and installation instructions in accordance with Division 1 for all piping materials to be used for each system, valves and hydronic specialties as specified herein.
- B. Shop Drawings:
 - 1. Submit in accordance with Section 01 3300 and Section 23 0500.
 - 2. Submit 1/4" = 1'-0" Scale HVAC and Plumbing Piping Shop Drawings.
 - 3. Overlay piping Shop Drawings over other Shop Drawings of other trades to include electrical and sheet metal Shop Drawings.
 - 4. Plan views of congested areas and sections thereof shall be drawn at a scale of 3/8" = 1'-0".
 - 5. A "Release of Liability" form must be signed after which electronic files will be produced.
- C. Fully coordinate all piping shop drawings with sheet metal shop drawings and other trades. Failure to submit shop drawings in a timely manner, as required to keep pace with the construction and work of all other trades, will result in delays, and possible stoppage, of payment to the Contractor. Additionally, no work may proceed until such shop drawings are submitted, reviewed, and found to be acceptable by the Engineer.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Storage and protection of materials shall be in accordance with Section 23 0500.
- C. Take special precautions to protect control valve internals from construction dirt and debris. If valves are stored on site cover valve openings until just prior to installation but in no case shall valves be unprotected for more than 48 hours.
- D. Openings in piping system, coil headers, and other heat exchangers shall be covered during the construction period to protect the interior accumulation of dirt and debris in these systems until immediately prior to connection to these components to similarly protected systems.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

- A. In general, the following listed materials shall be used in fabricating the piping systems. Where special classes of piping are involved and are not listed, the Contractor shall request instructions as to the class of material involved and the method of fabricating it before ordering the materials. Steel pipe 2-1/2" and larger shall generally have plain ends to be assembled by welding and pipe 2" and smaller shall generally have screwed ends, except where special requirements dictate otherwise.
 - 1. Condensate drains from cooling coils: Type "M" or DWV (1-1/4" and larger) hard drawn copper below the roof.
 - 2. Condensate drain lines with Pro-Press type fittings: Type "L" hard drawn copper tubing below the roof.
 - 3. Refrigerant Piping: Type "ACR" hard drawn copper with 156 Silfos solder joints. Refer to specification Section 23 23 00, "Refrigerant Piping".
- B. Steel pipe shall be made and tested in accordance with the latest edition of the "Standard Specifications for Welded Steel Pipe" of the National Tube Company, or Youngstown Sheet and Tube Company. Piping 2" and smaller shall be manufactured by LeClède, Sawhill, or Wheatland. Piping 2-1/2" and larger shall be manufactured by Tex-Tube, Paragon, U.S. Steel, or Armco. Unless otherwise specified, all pipe shall be Schedule 40 of ASA Standard B36.10.
- C. In general, fittings used for the various piping systems shall be as listed below. Special fittings shall be used where required by job conditions and when approved for particular use.
 - 1. Welding Fittings: All fittings in welded lines shall be factory fabricated welding fittings of the same material and the same schedule or weight as the piping system in which installed.
 - a. All elbows, reducers, tees, caps and special fittings shall be standard factory fabricated butt-welding fittings, conforming to ANSI B16.9, with the following exceptions: Branch takeoffs from lines 2-1/2" in size and larger and where the size of the takeoff does not exceed two-thirds of the nominal diameter of the mains to which connected may be made with shaped nipples or with Bonney or Grinnell Weldolets or Thredolets as required by the class of fabrication. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

- b. Welding fittings shall be Weldbend Corporation, Tube Turn, Hackney, or approved equals. Welding and fittings shall have the same bursting pressure as pipe of the same size and schedule. All elbows shall be the long radius type unless noted otherwise.
- D. Screwed Fittings in Steel Lines: 150 lb. black malleable iron banded pattern screwed fittings made by Grinnell Company, Crane Company, or Walworth Company. All screwed fitting elbows shall be the long radius type unless noted otherwise.
- E. Fittings for non-propress copper tubing shall be Chase Sweat Fittings, Nibco, Elkhart, or Mueller Brass Company's "Streamline" type solder fittings. Drainage type fittings shall be used wherever possible in drainage systems only. All solder for copper tubing shall be 95-5, Silfos or Eutectic No. 180F. All piping shall be installed according to the manufacturer's instructions. All joints shall be thoroughly cleaned before connecting. Silfos solder shall be used on all refrigerant piping. All elbows shall be the long radius type unless noted otherwise.
- F. As an alternate to standard sweat fittings for copper tubing, Pro Press type fittings shall be allowed for all drain lines as follows:
 - 1. 3" and smaller, wrought copper. Press fittings, or ASME 16.2.2, ASME 15.18 sealing with EPDM sealing element for ½" to 2" and ProPress XL for 2-1/2" to 3.
 - 2. Contractor shall provide Owner at completion of project one (1) complete set (½" to 3") of new actuators and jaws.
- G. Miscellaneous Fittings: Provide all reducers, increasers, adapters, bushings, etc., as required to properly inter-connect the various items, to change sizes, etc. Steel fittings shall be used in steel lines, and copper and red brass fittings shall be used in copper lines.
- H. All piping materials and fittings shall be **manufactured in the United States**.

2.2 FLANGES

- A. Flanges in welded lines for water systems shall be 150 pound forged steel, welding neck flanges, except where cast iron fittings are used as specified elsewhere in these specifications, and except as otherwise shown.
- B. Flanges in screwed ferrous lines shall be 125 pound cast iron or 150 pound forged steel screwed flanges.
- C. Where ferrous flanges connect to flat faced flanges on valves, items of equipment, etc., the companion flange shall be flush faced and where the flanges on items of equipment are raised face flanges, the companion flanges shall have raised faces.
- D. Flanges in copper lines shall be solder joint type cast brass flanges.
- E. Flange bolts and nuts shall conform to the applicable requirements of the latest edition of the Code for Pressure Piping.
- F. Slip-on welding neck flanges are prohibited.
- G. Flanges shall be Weldbend, Tube Turn, Hackney, or approved equals.

2.3 GASKETS

- A. Install gaskets between flanges of all flanged joints. Where used with brass or bronze flanges or with flat face ferrous flanges, they shall be full face type. For all other flanges they shall be ring gaskets properly cut to fit within the inside edges of the bolts.

- B. Gaskets in water lines shall be Garlock No. 24 Wire Insertion Red Rubber Sheet Packing, 1/16" thick and for any other systems use special materials suitable for the duty as recommended by their manufacturer.

2.4 INSULATING FITTINGS

- A. Except that no dielectric fitting shall be installed in connections between copper or brass and sanitary cast iron waste, drain and vent lines, wherever an interconnection is made between ferrous pipes or vessel and copper tubing or brass pipe, or vice versa, install a dielectric fitting.
- B. In lines assembled with screwed or soldered joints, use insulating couplings (unions) suitable for the intended service and where flanged connections are required, use insulating gasket material between flange faces, insulating grommets between bolts and holes in flanges and insulating washers under both bolt heads and nuts.
- C. PVC couplings of any kind shall not be acceptable for insulating couplings.
- D. Insulating fittings shall be suitable for the service medium, operating pressure and temperature. Fittings shall be rated for 1.5 times the normal system operating temperature and pressure in which installed.
- E. Insulating fittings shall be as manufactured by EPCO, Maloney, or Crane.

2.5 PIPE HANGERS

- A. Pipe hangers shall be as manufactured by Anvil International, Inc. and be of a type suitable for each use. Approved equals by Mason Industries, Inc., B-Line, Grinnell, and PHD Manufacturing, Inc. will be considered.
- B. For cast-iron pipes up to three inches (3") in size, use Anvil Fig. 104 malleable iron, adjustable, split ring, swivel hanger, or Anvil Fig. 590 steel clevis hanger. For cast iron plumbing piping four inches (4") and larger, use only Anvil Fig. 590 steel clevis hanger.
- C. Where several pipes are routed parallel to each other and at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where rollers are called for elsewhere by these specifications.
- D. For bare copper pipes (uninsulated only) up to and including three inches (3") in size, use Anvil Fig. CT-109 malleable iron, copper plated, split ring, hangers or Anvil Fig. CT-65 copper plated clevis hangers. For uninsulated copper pipes larger than three inches (3"), use Anvil Fig. CT-65 copper-plated clevis hanger.
- E. Hanger rod sizes shall conform to the following schedule:

Pipe up to, and including 2"	3/8" rods
Pipe 2-1/2", 3", and 3-1/2"	1/2" rods
Pipe 4" and 5"	5/8" rods

- F. Unless shown otherwise on the Drawings, all horizontal runs of ferrous piping shall be suspended from the floor or roof joists or beams, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to, and including 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and 3"	12 feet
Pipe 3-1/2" and 4"	14 feet

- G. Unless shown otherwise on the Drawings, all horizontal runs of copper piping shall be suspended from the floor or roof joists or beams, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 3/4" in size	6 feet
Pipe 1" and 1-1/4"	8 feet
Pipe 1-1/2" and 2"	10 feet
Pipe 2-1/2" and larger	12 feet

- H. There shall be a hanger within two feet (2') of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps. Vertical pipes within a space shall have not less than two (2) supports. Where the vertical run of pipe in a space exceeds 14 feet then three (3) supports shall be required.
- I. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.
- J. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Anvil Fig. 281, wedge type, concrete inserts. All inserts shall be pre-treated to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.
- K. Expansion bolts shall be Ackerman-Johnson.
- L. Beam clamps suitable for the use with the type of steel construction involved shall be an Anvil product or an approved equal as indicated elsewhere herein.
- M. No perforated straps shall be used to support any mechanical equipment item or piping of any kind.
- N. Condensate drain piping hangers shall be sized to go around the insulation with shields being provided to protect the insulation. Shields shall be Anvil Fig. 167.
- O. All steel hangers, base plates, supports, nuts, bolts, and all thread rod located outdoors, in crawl spaces, and exposed to the weather, shall be made of galvanized steel or equally suitable corrosion resistant steel alloy or aluminum. Where steel components are allowed and used under these conditions they shall be painted with an equivalent protective coating similar to a two-part epoxy. Refer to Section 09 90 00.
- P. For pipe sizes 8" and under use Anvil Fig. #93 and 94 beam clamps. For pipe sizes 10" through 18" use Anvil Fig. #66 in the "U" position.

2.6 SLEEVES AND ESCUTCHEONS

- A. Generally, where pipes pass through interior building walls or floors above the first floor (out of the ground), 22 gauge galvanized sheet metal sleeves shall be used. Sleeves shall extend a minimum one inch (1") above a floor or beyond the wall, as applicable.
- B. All pipes penetrating grade beams, exterior walls, concrete structural members, or concrete slabs of mechanical equipment rooms on the first floor shall generally use standard weight galvanized steel pipe as the sleeving material.
- C. For concrete or masonry walls, sleeves shall be inserted into the masonry, decking or form work prior to the pouring or placement of concrete or masonry units to create a leave out.

- D. The sizes of all sleeves shall be such as to permit the subsequent insertion of the intended pipe of the proper size with adequate clearance for movement due to expansion and contraction. In the case of insulated lines, the diameter of the sleeves shall be at least 1/2" greater than the outside walls of the pipe with specified thickness of insulation. This will require that the inside diameter of galvanized steel pipe sleeves be at least 1/2" greater than the outside diameter of the service pipe with insulation. Galvanized steel pipe sleeves set in floors shall project two inches (2") above the floor.
- E. After the pipes are installed, fill the annular space between the pipe, and insulation as required, and its sleeve with an approved mastic or caulk. Use loose fibrous insulation packing as required to accomplish this. In all cases the annular spaces around the pipes within the sleeved openings shall be filled with loose fibrous insulation and then sealed with an approved caulking or expanded foam insulation.
- F. Escutcheons, except as specifically noted or specified, shall be installed on all pipes passing exposed through floors, walls, or ceilings. Escutcheons shall be equal to the Crane No. 10, chrome plated sectional floor and ceiling plates, and shall fit snugly and neatly around pipe or pipe insulation or insulated lines. Solid chrome plates with set screws shall be used if sectional plates do not fit properly or stay in place. Where multiple pipes penetrate floors or walls in close proximity in concealed areas, shop made sheet metal escutcheons may be used.
- G. Pipes sleeved through grade beams open to basements, crawl spaces or void spaces below grade shall additionally receive "Link Seal" or equal closures made of interlocking synthetic rubber links. Seals shall provide for absolute water tightness. Seal shall be constructed to insulate electrically pipe from wall. Install as recommended by manufacturer. Provide Century-Line sleeves with water stop and anchor collar for pipes penetrating grade beams designated to be anchored.
- H. Where PVC pipes, 3 inches and smaller, and small copper water piping under 2 inches in size, penetrated a horizontal floor slab a metal sleeve will not be required. For these piping systems, completely wrap the piping with a polyethylene tape, or wrapping. This tape shall be minimum 4 mils thick and shall be wrapped at least two times around the pipe and secured sufficiently to hold the wrap in place during the pouring of the slab. This wrap shall be in sufficient length or height to ensure that no concrete will be in contact with the pipe. All other piping shall be sleeved as indicated elsewhere herein.
- I. Refer to Section 23 05 00 for additional requirements of penetrations through fire-rated assemblies.

2.7 ACCESS DOORS

- A. Wherever access is required above inaccessible ceilings, in walls, furrings, chases or soffits to physically reach concealed piping, ductwork, fire/smoke dampers or mechanical equipment installed under Division 23, provide access doors of sufficient size to maintain, repair, replace or suitably access devices intended to be adjusted as indicated herein.
- B. Provide an access door or panel for each of any valves, group of valves, damper pull rods, splitter dampers, manual volume dampers, actuators or other controlling mechanism installed under Division 23 which would otherwise be concealed in the building construction with no access.
- C. All access doors in toilet rooms, locker rooms, showers, or other similar wet areas shall be the flush mounted type and be made of brush or satin finish stainless steel as manufactured by Milcor.
- D. All access doors shall be minimum 12" x 12" in size unless otherwise approved in writing in advance by the Engineer. Doors shall be increased in size as required to allow for a

person to reasonably access, adjust, maintain, service, inspect or replace the largest single component concealed. Provide special sizes of access doors as required.

- E. Coordinate the final location of all concealed equipment and devices requiring access with the final location of the required access panels or doors. Allow ample space for the removal of all parts and equipment that require replacement or servicing.
- F. Where mounting heights are not detailed or dimensioned, install mechanical piping and overhead equipment to provide the maximum headroom possible while maintaining reasonable access and service to those items being accessed.
- G. Extend all equipment grease fittings to an accessible location which shall be within reach (maximum of 18") from the access door.
- H. Install all access doors in locations to suit the intended purpose but have each location reviewed and approved by the Engineer. In no case shall access doors be located such that the intended purpose is rendered useless.
- I. Access doors shall all have spring concealed hinges, screwdriver operated cam latches, be the flush mounted type, open up to, but not more than, 175 degrees, be made of steel, or stainless steel to suit the application, be fire rated (U.L. rated) to match the rating of the surface where the door is placed, and have a powder coated electrostatic primer paint on all steel doors. Furnish the following access door types as described below:
 - 1. Milcor Style DW - Flush drywall type with frame made of 16 gauge steel, panel door made of 14 gauge steel, galvanized steel drywall bead on frame, and removable hinge pins for removal of panel door. Provide minimum of two hinges (12" x 12" and larger) up to 24" x 24" in size and three hinges on access doors above this size. Provide one cam for access doors 14" x 14" and smaller and a minimum of three cams on larger sizes.
 - 2. Milcor Style K - Flush plaster wall or ceiling type made similar to Style DW except with a 22 gauge expansion casing bead, one hinge on 12" x 12" access doors, two hinges on larger doors with either side no larger than 24", three hinges on doors with any dimension of 24" or larger, minimum one cam on doors with no dimension larger than 18" and two or more cams on larger access doors.
 - 3. Milcor Style M or MS - Flush drywall, masonry or tile type made similar to Style DW except with 14 gauge steel frame and doors (16 gauge when made of stainless steel-satin finish), one hinge on access doors up to 18" x 18" in size, two hinges on sizes 20" x 24" and 22" x 22", three or more hinges on sizes 24" x 24" and larger, and the number of cams as standard with the manufacturer.
 - 4. Provide other types of access doors suitable for the application to include surface mount, double leaf for access doors exceeding 36" in any dimension, louvered where indicated on the Drawings, fire rated, recessed or security/detention types as required and compatible with the surface penetrated.

PART 3 EXECUTION

3.1 PIPING - GENERAL

- A. Where special classes of piping are involved and are not listed, the Contractor shall request instructions from the Owner's Representative as to the class of material involved and the method of fabricating it before ordering any material. All steel lines 2-1/2" and larger shall be assembled by welding. All steel lines 2" and smaller may be assembled either by welding or by screwed fittings as specified.

- B. Welding shall be done by mechanics who satisfy qualification requirements of the American Welding Society. The pipe ends to be welded shall be machine beveled wherever possible. Gas cuts shall be true and free from all burned metal. Before welding, surfaces shall be thoroughly cleaned. The piping shall be carefully aligned and no metal shall project within the pipe. Fully ream, to the full inside pipe diameter dimensions, the inside of all piping to be welded. Miter joints will not be allowed in any case. All headers, connections, elbows, reducers, flanges, and special flanges and special fittings shall be made using forged steel welding fittings of the same weight as the pipe to which they are attached. All unions and connections to valves 2-1/2" and larger shall be made by the use of welded flanges.
- C. Branches in lines where the branch side is equal to 2/3 of the size of the main or smaller may be connected by using Weldolets or Thredolets; where the sizes are greater than 2/3 of the main, standard weight seamless tees as manufactured by Tube-Turns or Grinnell, A.S.T.M. Standard A-234 shall be used.
- D. The location, direction, and size of all lines are generally indicated on the drawings. Branch connections in general are indicated and shall be so installed as to provide proper grades.
- E. All lines shall be made up straight and true at proper grades. All water filled and condensate drain lines shall grade down to drains.
- F. Piping shall follow as closely as possible the routes shown on the plans and take into consideration conditions to be met at the site. Should any unforeseen conditions arise, lines shall be changed or rerouted as required after proper approval has been obtained.
- G. All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which the lines are connected.
- H. All headers shall be assembled as indicated using welding fittings throughout.
- I. All screw joints shall be made with taper threads, properly cut. Joints shall be made tight with graphite and oil applied to the pipe threads only and not to the fittings.
- J. Dielectric couplings shall be installed where ferrous pipe joins copper lines and shall be rated for the intended medium pressure and temperature or service.
- K. Provide and install unions at proper points to permit removal of pipe and various equipment and machinery items without injury to other parts of systems. No unions will be required in welded lines or lines assembled with solder joint fittings except at equipment items or coils, machinery items and other special pieces of apparatus. Unions in 2" and smaller lines shall be ground joint and unions 2-1/2" and larger shall be flanged unions. Unions shall be the same material and strength as other fittings in the lines. Companion flanges on lines at various items of equipment, machines, and pieces of apparatus shall serve as unions to permit removal of the particular item.
- L. All piping shall be supported by hangers independently of equipment connections. The weight of the piping and its contents shall not be imposed on the equipment in any way.
- M. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.
- N. Swing joints or expansion loops shall be provided wherever shown on the Drawings or wherever else necessary to allow for the expansion and contraction of piping. This shall be accomplished in an approved manner and this Contractor shall be responsible for any damage which may occur as a result of expansion and contraction of his piping.

- O. Nipples shall be of the same size and material as the piping in the system in which the nipples are installed, except that "close", or "all thread" nipples shall not be used.
- P. Keep all open ends of piping in each system plugged or capped to prevent dirt or other debris from entering the pipe at any and all times during construction and before fixtures or equipment is connected. All piping shall be flushed clear prior to connection to the central building systems.
- Q. The ends of all piping furnished and installed in all systems shall be thoroughly reamed to the full inside diameter of the respective pipe.
- R. Exposed and concealed lines shall be run parallel with, and perpendicular to building lines and wherever possible shall be grouped together for easy service and identification. Whenever possible, horizontal and vertical runs shall be held as close as possible to the walls, ceilings, struts, members, etc., so as to occupy the minimum space consistent with the proper installation requirements for insulation, conduit, ductwork, lighting fixtures, etc., and the expansion requirements of each of these items and the building proper or the removal of the respective or adjacent pipes, conduits, and ductwork, and to allow for necessary access to valves, other pipes, conduits, dampers, etc.

3.2 CROSS CONNECTION AND INTERCONNECTIONS

- A. No plumbing fixtures, device, or piping shall be installed which will provide a cross connection or interconnection between a distributing water supply for drinking or domestic purposes and a polluted supply such as drainage system, or a soil or waste pipe which will permit or make possible the backflow of sewage, polluted water, or waste into the water supply system.

3.3 FLASHINGS

- A. Flash around all pipes passing through the roof with sheet lead, built a minimum of 10" into the roofing, in all directions from the outside of the pipe running up the pipe a minimum of 10" and more where vent terminals must be higher to conform to the requirements of the local Plumbing Code in effect, and then turned over one inch (1") into the pipe cavity. All seams and joints shall be completely soldered closed and the entire flashing shall be completely waterproof.
- B. Make all roof penetrations in accordance with the roofing system manufacturers approved methods.

3.4 PIPE INSULATION INSERTS AND SHIELDS

- A. Provide a section of Foamglas insulation, calcium silicate, or urethane of thickness specified at hanger support locations and provide No. 16 gauge galvanized steel protection shield minimum 12" long. Shield shall be full half cylinders equal to Grinnell Fig. 167.
- B. Refer to Section 23 0700, Insulation.

3.5 SAFETY GUARDS

- A. Furnish and install all safety guards required in order to obtain certificates of inspection from all authorities having jurisdiction.
- B. All belt driven equipment, projecting shafts and other rotating parts shall be enclosed or adequately guarded.

3.6 TESTING AND REPAIRING

- A. During the progress of each portion of the work or upon its completion, make such tests of this work as herein specified, or as required by the Architect, or by State or Municipal Bureaus having jurisdiction and under their supervision.
- B. Provide all apparatus, temporary piping connections, or any other requirements necessary for such tests. Take all due precautions to prevent damage to the building and its contents incurred by such tests as will be required to repair and make good, at no cost to the Owner, any damage so caused. Testing of piping to be insulated shall be done before insulation is applied.
- C. Perform any other tests as may be required by the Owner's Representative to indicate the fulfillment of specification requirements.
- D. All water piping shall be hydrostatically tested to a pressure of 150 psig or to 1-1/2 times the operating pressure, whichever is the greatest, for six (6) hours.
- E. Systems shall be tested in portions as required by the construction schedule and the portions being tested shall be effectively isolated and sealed off. When previously tested sections are connected into other sections, tests shall be rerun to include the new connections.
- F. Partial systems shall be tested prior to connecting into existing lines.
- G. Leaks in screwed joints shall be repaired by tightening the joint until the leak has stopped, or by remaking the joint if tightening fails to stop the leak. Leaks in welded joints shall be repaired by chipping out the weld around the leak and rewelding until it is stopped. Leaks in caulked joints shall be completely stopped by additional caulking of the joint, but, if that fails, the joint shall be re-made. A leak in a compression joint shall be repaired by remaking the joint using a new seal, compression ring, coupling, etc., as required. Leaks in soldered joints shall be repaired by remaking the joint and no soldering or brazing over existing joints will be permitted. Any defective piping shall be replaced.
- H. Additional testing shall be as specified in the individual Sections of these Specifications.
- I. During testing and cleaning of piping systems, use a fine mesh, 20 mesh or smaller, start-up strainer screen for all strainer pipe sizes. After piping system is cleaned each strainer shall be taken apart, cleaned, and final strainer mesh shall be placed back in strainer for normal operating conditions.

3.7 SEALING PENETRATIONS

- A. Seal all pipe and duct penetrations through walls run to structure, ceilings, floors and roofs. Fill the annular space between the insulation on the pipe, or the pipe only where uninsulated, or duct and its sleeve, with neoprene or non-hardening sealant.
- B. No pipe or duct shall be allowed to contact its surrounding sleeve or the wall, floor, or ceiling. Effective isolation shall be provided as described in Section 23 05 48 to the end that no vibration or direct noise transmission shall be transmitted. Vibration transmission limits shall be as established in Section 23 05 48. Use special materials as may be required to comply.
- C. Firestop pipe and duct floor and wall penetrations.

3.8 PAINTING

- A. All equipment specified in Division 23 shall be delivered to the site with suitable factory finishes as specified elsewhere herein.

- B. Items with factory applied finishes shall be protected during installation and other construction work. Damaged factory applied finishes shall be refinished to match the original finish appearance.
- C. Field painting of items specified and installed in Division 23 shall be as specified in Section 09 9100.
- D. All ferrous metals that are not galvanized or made of a corrosion resistant alloy shall be painted. This shall include steel pipe hangars, trapeze supports, pipe stands, all thread hangar rods and other miscellaneous systems.

END OF SECTION

SECTION 23 2300

REFRIGERANT PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other divisions for coordination of work with other portions of Work.

1.2 SYSTEM DESCRIPTION

- A. Furnish and install all refrigerant piping of every kind required, specified, or shown on the Drawings for the installation of the work specified in Division 23. The location, direction, and size of the various lines are indicated on the Drawings. Lines for pilot and controls and instrumentation are not shown but shall be installed as required and as specified.
- B. Piping systems shall include all appurtenances shown on the drawings and specified herein.
- C. Valves or cocks shall be installed to control the flow of refrigerant to each of the various systems, to segregate individual items of equipment, and to permit ease of installation and servicing as directed on the Drawings and specified.
- D. The work shall include the furnishing and installing of all supporting structures and members for pipes and equipment.
- E. Support devices and members shall include vibration and noise isolating devices and assemblies. Penetrations of walls to structure shall be sealed off to limit noise transmission through sleeves.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality.
- B. All equipment and materials shall be installed by experienced mechanics certified and trained for the work performed.

1.4 SUBMITTALS

- A. Product Data: Submit complete manufacturer's descriptive literature and installation instructions in accordance with Section 01 3300 for all piping materials to be used for each system, valves and refrigerant specialties as specified herein.
- B. Shop Drawings: Submit in accordance with Sections 01 3300 and 23 0500. Submit 1/4" = 1'-0" Scale Refrigerant Piping Shop Drawings. These shop drawings may be inclusive with other piping or ductwork shop drawings.

1.5 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored and which is damaged or defaced during construction shall and will be rejected.
- B. Storage and protection of materials shall be in accordance with Section 23 0500.
- C. Take special precautions to piping and special internals from construction dirt and debris. If valves are stored on site cover valve openings until just prior to installation but in no case shall valves be unprotected for more than 48 hours.

- D. Openings in piping system, coil headers, valves and other heat exchangers shall be covered during the construction period to protect the interior accumulation of dirt and debris in these systems until immediately prior to connection to these components to similarly protected systems.

PART 2 PRODUCTS

2.1 PIPING MATERIALS

- A. In general, the materials indicated herein shall be used in fabricating the refrigerant piping systems. Where special classes of piping are involved and are not indicated, the Contractor shall request instructions as to the class of material involved and the method of fabricating it before ordering the materials.
- B. Piping shall be Type L, ACR cleaned and capped, copper. All fittings shall be long radius elbows and standard tees.
- C. Only "Silfos" solder joints shall be used for fitting fabrication.
- D. Miscellaneous Lines: Pilot, bleed, control, sampling, and equalizing lines, and similar auxiliary lines shall be fabricated of the material used in the system to which they are connected in each case.
- E. Miscellaneous Fittings: Provide all reducers, increasers, adapters, bushings, etc., as required to properly inter-connect the various items, to change sizes, etc. Copper and red brass fittings shall be used in copper lines.
- F. Fittings for copper tubing shall be Chase Sweat Fittings or Mueller Brass Company's "Streamline" solder fittings. All piping shall be installed according to the manufacturer's instructions. All joints shall be thoroughly cleaned before connecting. Silfos solder shall be used on all refrigerant piping.

PART 3 EXECUTION

3.1 DELIVERY AND PROTECTION

- A. Deliver all piping and appurtenances to each site. All components shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All items shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces. Rejected items shall be replaced promptly at no cost.
- B. During construction, take all steps necessary to protect piping and accessories from damage or vandalism. All damage or vandalism shall be repaired at no cost to the Owner.

3.2 CONDENSING UNIT INSTALLATION

- A. Install condensing units level on concrete equipment pads where shown with vibration isolation as specified in Section 23 0548.
- B. Route refrigerant piping and make connections to DX coils as recommended by the unit manufacturer and as required to meet the capacity control requirements specified.
- C. Furnish and install, if not specified to be factory assembled, all refrigerant piping specialties including, but not limited to, thermal expansion valves, sight glasses, solenoid valves, accumulators, hot gas bypass components, hot gas mufflers, and filter dryers.
- D. Charge all refrigerant piping systems and equipment to maintain a fully operating refrigerant charge.

- E. Pipe refrigerant relief piping to the outdoors or as otherwise required by the local authorities having jurisdiction and the manufacturer.

3.3 REFRIGERATION PIPING

- A. Piping shall be Type "L" copper. ACR cleaned and capped. All fittings shall be cleaned and degreased before use.
- B. Flow inert gases such as dry nitrogen through the piping while heating pipe or fittings for joining. Install liquid line drier and sight glass near condensing unit.
- C. Leak testings: After the system is installed and before any piping is insulated. The entire refrigeration circuits must be thoroughly leak tested. The following test procedure is recommended:
 - 1. Remove and plug the connection points of any controls or relief valves that could be damaged by test pressure.
 - 2. Connect a cylinder of oil-pumped, dry nitrogen to the front seat port of the compressor discharge valve or at the liquid line charging valve.
 - 3. Test at 150 psig or the leak test pressure specified by local code.
 - 4. Tap each solder connection sufficiently hard to start any leak that might subsequently open from thermal expansion and contraction or vibration.
 - 5. Test all pipe joints for leaks. Brush each connection with a soap solution and watch for bubbles.
 - 6. After leak test, charge enough refrigerant through the liquid line charging valve to raise the system pressure to approximately 10 psig. Remove the refrigerant connection and charge enough nitrogen into the system to raise the test pressure to 150 psig or the local code requirement.
 - 7. Check all parts of the system with a halide torch, or electronic leak detector.
- D. Evacuation:
 - 1. Connect the vacuum pump to as many points of the system as possible. Vacuum gauge, a Zimmerli Gauge, or an electronic vacuum gauge, shall be connected to the liquid line charging valve. Open compressor valves. Open the liquid line charging valve.
 - 2. Operate vacuum pump until a vacuum equivalent to 500 microns is registered by the vacuum gauge.
 - 3. When the system has been evacuated, charge enough oil-pumped dry nitrogen into the system to raise the pressure to atmospheric. Re-evacuate the system.
 - 4. After the 500 micron vacuum reading has been re-established, stop the system and allow it to stand under vacuum for a minimum of 12 hours. If the vacuum reading remains unchanged, the system is ready to receive its charge of refrigerant.
- E. Charging:
 - 1. Charge the system with new, clean oil and refrigerant of the proper type.
 - 2. Charge until the sight glass is bubble free.
 - 3. Check charge level after system has operated for 24 hours in warm weather. Add oil and refrigerant as needed under these conditions.

END OF SECTION

SECTION 23 3000

HVAC AIR DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

- A. The scope shall include the furnishing and installation of all ductwork as shown on the Drawings; acoustical and thermal linings; flexible ducts and connections; combination smoke and fire dampers, smoke dampers, and fire dampers; duct access doors; air diffusers, grilles and registers; air volume control devices; hangers and supports; plenums and casings; turning vanes; air filters; installation of temperature control dampers, and other appurtenances necessary for a complete and operational system.
- B. All work shall be preceded by taking measurements at the job site, fully coordinating all work with other trades, verifying available spaces for ductwork, and developing Shop Drawings illustrating such.
- C. Test all low pressure ductwork systems (constructed to 2.0 inches water gauge and higher) for leaks and repair leaks to limit leakage rate to that as specified.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the quality as specified herein. All work shall comply with the most recent Local Building Code, Mechanical Code, Fire Code, and all other applicable National, State and Local Codes or ordinances.
- B. All equipment and materials shall be installed in a workmanlike manner by trained and experienced sheet metal technicians and mechanics as recommended by the manufacturers of the products installed.
- C. Where the standards and requirements of this specification exceed those of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) the requirements herein shall govern. As a minimum all ductwork shall be constructed to meet all functional criteria defined in Section 11 of the 2005 SMACNA "HVAC Duct Construction Standards, Metal and Flexible," Third Edition. However, all ductwork shall comply with all code requirements noted above to include meeting deflection limits established in the local Mechanical code.
- D. The work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job, "Substantial Completion", against noise, chatter, whistling, or vibration, and free from pulsation under all conditions of operation. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Owner's Representative.
- E. Air quantities shown on the Drawings, or specified, are based on air at 75 Deg.F. dry bulb, 50 percent relative humidity, and 29.92 inches H.G. barometric pressure.
- F. Except where specified otherwise, all sheet metal used shall be constructed from prime galvanized steel sheets or coils up to 60 inches in width. Each sheet shall be stenciled with manufacturer's name and gauge. Coils of sheet steel shall be stenciled throughout

on 10 foot centers (fabricate with stencils to the outside of the ductwork so they are visible when installed) with manufacturer's name and gauge tolerances in inches:

Gauge No.	Nominal Thickness	Minimum Thickness
26	0.0217	0.0187
24	0.0276	0.0236
22	0.0336	0.0296
20	0.0396	0.0356
18	0.0516	0.0466

- G. Contractor shall comply with this specification section in its entirety. If during a field observation, the engineer of record finds changes have been made without prior written approval, the contractor shall make the applicable changes to comply with this specification at the contractor's expense.
- H. At the discretion of the Engineer of Record, sheet metal gauges and reinforcing may be randomly checked to verify all duct construction is in compliance with this specification section.
- I. All ductwork and fittings shall have a computer generated label affixed to each section detailing all applicable information including the duct dimensions, gage, reinforcement type/class, and connector type of the systems manufacturer. In addition, galvanizing thickness and country of origin shall be clearly stenciled on each duct section.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions in all items specified herein in accordance with Section 23 0500.
- B. Shop Drawings shall be submitted on all items of sheet metal work specified herein. Shop drawings of ductwork shall be submitted at a minimum scale of 1/4" equal to one foot except that the Congested Areas and all Air Handling Unit Mechanical Rooms shall be submitted at a minimum scale of 1/2" = 1'-0". Provide sections for all Congested Areas and Mechanical Room Plans.
- C. Shop Drawings shall include the reflected ceiling plan, screened back, overlaid onto the floor plan indicating the proposed installation of all light fixtures; ductwork layout; duct fittings; duct connection details; offsets; bottom of duct elevations; all sheet metal dimensions (sizes); overall air device sizes, air device neck sizes, air device air flow quantities, and device type; duct pressure classifications; all mechanical piping; any conflicts discovered and unresolved through the use of transitions and offsets in the available space; turning vanes; manual volume dampers; automatic control dampers; smoke and fire dampers; duct access doors; flexible connections; and all mechanical fans and equipment.
- D. Sheet metal shop drawings shall be overlaid on piping shop drawings and other shop drawings for other portions of work specified in other sections of these specifications for complete coordination of all work prior to commencing with any installation. These Shop Drawings shall not be prepared directly on the Shop Drawings of other trades; they will be separate from all other shop drawings. Coordination Drawings shall be prepared in accordance with Specification Sections 01 3300.
- E. Shop Drawings shall be based on actual field measurements taken at the job site and shall take into consideration all obstacles and be fully coordinated with all piping, conduits, structure, equipment, and general construction features.

- F. Shop Drawings shall be generated by a computer aided design and drafting (CADD) system as a CADD drawing. CADD files with Architectural Backgrounds and Mechanical design drawing files will only be provided when requested, if this privilege has not been previously abused, after a Release of Liability Form has been completed.
- G. Include a brochure, with individually assembled cut sheets, and details of all sheet metal fittings, duct construction standards proposed for each system, air volume control devices, and other accessories proposed to be used for job duct construction standards. This shall be done prior to submission or preparation of any sheet metal shop drawings.
- H. Should any ductwork installation commence without approved ductwork shop drawings or written approval by the Engineer of Record, the Contractor assumes all liability, to include all costs, in revising any portion of the sheet metal work that is deemed unacceptable by the Owner's Representative to include any conflicts discovered in installation that could have been resolved through the Shop Drawing process.

1.5 GUARANTEE

- A. The work shall be guaranteed for a period of one (1) year from and after the date of acceptance of the job, "Substantial Completion", against noise, chatter, whistling, or vibration, and be free from pulsation under all conditions of operation. This guarantee shall include defects in material, equipment and workmanship.
- B. After the system is in operation, should these defects occur, they shall either be removed and replaced or reinforced as directed by the Owner's Representative. This shall include repair of damages to building materials related to these deficiencies.

1.6 PRODUCT HANDLING

- A. Cover and protect material in transit and at site. Material not properly protected and stored, which has been damaged or defaced, or which has gotten wet during storage or construction shall be rejected.
- B. Prior to ductwork being installed the roof system, or floor above the ductwork, must be sufficiently installed to protect ductwork from rain water entering ductwork. If the building is not dried-in and walls, windows, etc., are not completed, then cover all openings in ducts with securely fastened heavy duty, minimum three (3) mil thick, plastic to protect from rain damage.
- C. Storage and protection of materials shall be in accordance with Section 23 0500.

PART 2 PRODUCTS

2.1 DUCTWORK

- A. General:
 - 1. All ductwork shown on the Drawings, specified or required for the heating, ventilating, and air conditioning systems, shall be constructed and erected in a first-class workmanlike manner by trained and skilled sheet metal workers.
 - 2. All ducts shall be erected in the general locations shown on the Drawings, but must conform to all structural and finish conditions of the building. Before fabricating any ductwork, Contractor shall check the physical conditions of the job site, and shall make all necessary changes in cross sections, offsets, etc., whether they are specifically indicated or not.
 - 3. Before starting shop drawings or fabrication of any ductwork, the Contractor must have an approved reflected ceiling plan with which he can coordinate location of air outlets, lights, tile patterns, etc.

4. The sizes of ducts indicated on the Drawings are the required net internal air stream dimensions, and where ducts are lined, the sheet metal sizes shall be increased three inches (3") in both dimensions to accommodate the linings (1-1/2" thick lining, unless indicated otherwise). Assume all rectangular ducts are lined unless noted otherwise.
5. Ductwork shall be classified, for construction standards, as follows:
 - a. All exhaust ductwork, except grease or other special exhaust systems specified elsewhere herein, all constant volume ductwork (supply and return) served by split DX A/C Units, (supply, return and outside air), and all transfer air ducts shall be constructed to meet one inch (1") W.G. standards.
6. Except as noted otherwise, ducts, plenums, and casings shall be constructed of new lock forming quality galvanized prime grade steel sheets. The gauges of metal to be used, duct construction details, and the construction and bracing of joints shall be in accordance with the latest edition of the published standards of the ASHRAE Handbook or in accordance with the latest editions of Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "Duct Construction Standards Manual, Metal and Flexible".
7. Plenum chambers shall be constructed of 18 gauge sheets thoroughly braced with 1-1/2 inch angle irons. All duct panels in rectangular galvanized steel ducts which are 12 inches and wider and which are not lined shall be cross broken.
8. Make square elbows where shown or required, with factory fabricated double thickness turning vanes. Job fabricated vanes will not be acceptable. Except as otherwise specified or indicated on the drawings, make all other changes in direction with rounded elbows having a centerline radius equal to 1-1/2 times the width of the duct in the plane of the bend.
9. Make transformations in duct shape or dimension with gradual slopes on all sides. Normally, make increases in dimension in the direction of air flow, with a maximum slope of one inch (1") in seven inches (7") on any side. Where conditions prevent the normal slope specified above, a maximum slope of one inch (1") in four inches (4") will be allowed only where conditions necessitate.
10. Where a transition must be made with less slope than that noted above, install single thickness guide vanes to ensure proper air flow, and to minimize air pressure drop. Transitions that require less slope than that noted above shall be noted on Shop Drawings, and require review and approval by the Engineer prior to installation.
11. Ducts shall be routed in conjunction with all types of pipes, electrical conduits, ceiling hangers, etc., so as to avoid interferences insofar as possible. When duct penetrations are unavoidable, provide streamline-shaped sleeves around such material penetrations, made airtight at duct surfaces, except that such sleeves are not required at tie rods. When the Contractor believes such penetrations are unavoidable, notify the Owner's Representative for approval prior to commencing with such work. Otherwise, all such penetrations are not expected to occur and are not allowed. Such penetrations will not be allowed for the convenience of, or lack of coordination by, the Contractor. Where obstructions necessitate, are approved by the Owner's Representative, and are of a size exceeding 10% of the total duct area, the duct shall be transformed to maintain the same original duct area.
12. Where each duct passes through a fan room wall, it shall be wrapped with not less than 1/2" thick closed cell neoprene tightly fitted to the outer surface of the duct all around and sealed. In lieu of this method, completely fill the annular space between the duct and penetration by packing with fibrous insulation and

- seal the perimeter of the penetration around the duct, on both sides of the penetration, with a flexible non-hardening sealant, to be fire rated when applicable.
13. All outlets or grilles in ceilings shall be supported rigidly from ceiling construction with suitable adapters or bucks installed as necessary and as shown to ensure outlets and grilles will be accurately trued up with ceiling.
 14. Ductwork shall be fabricated in a manner to prevent the seam or joints being cut for the installation of grilles or diffusers.
 15. All sheet metal ductwork shall be securely hung from the building construction. All ducts shall be hung adjacent to the seam in the duct and shall be secured in a suitable manner to both the duct and the building construction. All vertical riser ducts shall be supported at each floor with angle iron secured to the ducts and set on the structure members. These angles shall be the same size as specified for bracing.
 16. All holes in ducts for damper rods and other necessary devices shall be either drilled or machine punched (not pin punched), and shall not be any larger than necessary. All duct openings shall be provided with sheet metal caps if the openings are to be left unconnected for any length of time. All panels of uninsulated ducts twelve inches (12") and larger shall be cross broken. In general, sheet metal screws shall not be used in duct construction unless the point of the screw is in the air stream unless specifically indicated otherwise elsewhere herein.
 17. Manual dampers shall be installed as shown on the Drawings and as required to afford complete control of the air flow in the various duct systems. In rectangular supply ducts, a splitter damper shall be installed at each point where a branch is taken off and additional volume dampers shall be installed where shown or required to achieve the final air balance. No splitter dampers shall be installed in medium pressure ductwork, unless specifically shown on Drawings.
 18. Splitter dampers and volume dampers of the "butterfly" type, installed in rectangular ducts, shall be constructed of 16 gauge galvanized steel riveted or welded to square operating rods. Dampers shall have brass, bronze, or approved plastic bearings. The length of any splitter damper blade shall be 1-1/2 times the width of the smaller split in the duct, but shall be not less than twelve inches (12"). Where splitter dampers exceed 12 inches in height two (2) pull rods shall be used. Splitter dampers 12 inches (12") in height or less shall have one (1) pull rod.
 19. Butterfly damper blades in round ducts shall be the full width of the duct in which they are installed. Dampers shall be constructed of a minimum 22 gauge metal. Dampers over twelve inches (12") in diameter shall be constructed of 20 gauge metal, have a continuous rod with end bearings opposite the damper handle, and a quadrant type locking handle.
 20. The operating rods of all dampers shall be fitted with Young Regulators and the operating head shall be securely fastened in place so as to be accessible in the finished building unless shown otherwise. Operators shall be attached to duct where regulator occurs above a lay-in ceiling. Use a Ventlok No. 555 locking quadrant on accessible concealed splitter dampers. Where locking quadrants are installed on externally insulated ductwork a hat channel extension shall be used to match the same height as the insulation thickness. Where dampers occur above or behind plaster or other inaccessible ceilings, walls, chases or furrings, the regulator shall be the concealed type with adjustable cover plate equal to Young Regulator Company Type 315 with maximum 2-1/2" diameter cover plate and required accessories. Young Regulator bearings shall also be provided on the opposite end of each operating rod.

21. Behind each ceiling supply outlet, provide and install a turning vane or approved equalizing grid, where noted or scheduled. Where adjustable air pick-ups are indicated at points branch ducts meet trunk ducts, they shall be Titus AG-45 or approved equal with operator adjustable from the duct exterior.
22. Rectangular opposed blade volume dampers shall be as manufactured by American Warming and Ventilating or Ruskin. Blades shall not exceed 48 inches in length or twelve inches (12") in width, and shall be the opposed interlocking blade type. The blades shall be of not less than No. 16 gauge steel supported on one-half inch (1/2") diameter rustproofed axles. Axle bearings shall be the self-lubricating ferrule type.

B. Low Pressure Ductwork:

1. Rectangular low pressure ducts, systems designated to be operating at up to two (2) inches W.G., shall be constructed of the following gauges:

Largest Dimension of Duct	U.S. Gauge of Metal	Maximum Reinforcement Spacing
Up to 26"	26	5'-0"
27" to 42"	24	4'-0"
43" to 48"	22	4'-0"
49" to 60"	20	4'-0"
61" to 84"	18	4'-0"
85" to 96"	18	3'-0"
97" and Over	18	2'-6"

The above rectangular ducts shall be constructed in accordance with Section 1 the latest edition of the "Duct Manual" published by the Sheet Metal and Air Conditioning Contractors National Association. However, the gauge thickness of the ductwork shall meet that as scheduled above.

2. Rectangular low pressure ducts, for systems designated to be operating at up to one (1) inches W.G., shall be constructed of the following gauges:

Largest Dimension of Duct	U.S. Gauge of Metal	Maximum Reinforcement Spacing
Up to 36"	26	5'-0"
37" to 48"	24	5'-0"
49" to 60"	24	4'-0"
61" to 72"	22	4'-0"
73" to 84"	20	4'-0"
85" to 96"	18	4'-0"
Over 96"	18	2'-6"

The above rectangular ducts shall be constructed in accordance with Section 1 the latest edition of the "Duct Manual" published by the Sheet Metal and Air Conditioning Contractors National Association. However, the gauge thickness of the ductwork shall meet that as scheduled above.

3. Round low pressure ducts shall be spiral wound as manufactured by United Sheet Metal Company or have grooved seams with flat snaplock longitudinal seams. Spiral seam round duct gauge thicknesses shall be that standard by the manufacturer for the pressure rating of the system. Gauges for snaplock shop fabricated ducts shall be as follows, without exception:

Largest Dimension of Duct	Gauge of Metal	Gauge of Longitudinal Seams and Fittings
Up thru 8" in Diameter	26	26
9" to 14"	26	24
15" to 26"	24	22
27" to 36"	22	20
37" to 50"	20	18
51" to 60"	18	16

Elbows shall have a centerline radius of 1-1/2 times duct diameter or width and for round ducts may be smooth elbows or 5 piece 90 degree elbows and 3 piece 45 degree elbows. Joints of round ducts shall be slip type with a minimum of three (3) sheet metal screws.

4. All low pressure ductwork shall be externally sealed using water based products to include, United McGill Corporation United Duct Sealer, Hardcast "Iron-Grip 601", Childers CP-146, Foster 32-18 or Polymer Adhesive Sealant Systems, Inc. "Air Seal No. 11" duct sealer installed in the joints after closure. All sealants shall be U.L. rated for the application. Seal all external transverse joints, longitudinal seams, and all fitting connections externally to include sealing all duct work accessories, connections to accessories and duct and accessory penetrations (tubes, rods, wires, etc.). Do not seal control rods for actuated dampers and fasteners. Each system shall meet a seal class of "A".
5. Low Pressure Duct Supports:
 - a. All horizontal ducts up to and including 40 inches in their greater dimension shall be supported by means of No. 18 U.S. gauge band iron hangers attached to the ducts by means of screws, rivets or clamps, and fastened above to inserts, toggle bolts, beam clamps or other approved means. Duct shall have at least one pair of supports 8'-0" on centers. Clamps shall be used to fasten hangers to reinforcing on sealed ducts.
 - b. Horizontal ducts larger than 40 inches in their greatest dimension shall be supported by means of hanger rods bolted to angle iron trapeze hangers. Duct shall have at least one pair of supports 8'-0" on centers according to the following:

Angle Length	Angle	Rod Diameter
4'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
6'-0"	1-1/2" x 1-1/2" x 1/8"	1/4"
8'-0"	2" x 2" x 1/8"	5/16"
10'-0"	3" x 3" x 1/8"	3/8"

- c. Vertical ducts shall be supported where they pass through the floor line with 1-1/2" X 1-1/2" X 1/4" angles for ducts up to 60". Above 60" the angles must be increased in strength and sized on an individual basis considering space requirements.
6. All low pressure ductwork shall be reinforced to maintain a maximum reinforcement spacing as scheduled with the rigidity classification as needed to meet the specification construction standard. Reinforcement spacing shall be reduced as required to meet the construction standard specified using the gauge thickness scheduled.

C. Round Flexible Insulated Ductwork:

1. All round flexible insulated ducts, low and high pressure type, shall be factory fabricated and insulated as manufactured by Thermaflex or Flexmaster USA, Inc. Flexible ducts shall be equal to Thermaflex factory insulated type "M-KC" or Flexmaster "Type 3M".
2. Flexible duct thermal conductance shall be based on a 75 Deg. F. mean temperature and an aged condition (not out of the box value). Flexible duct insulation shall be a minimum nominal two inches (2.0") in thickness with a minimum 0.75 lb. density. The completed duct assembly shall have a minimum R-value of 6.0. To verify compliance with the Energy Conservation Code in effect, the minimum R-value of 6.0 will need to be documented on the outside of the jacket to allow field verification of compliance with this requirement.
3. The core liner of the flexible duct system shall be a tri-laminate aluminum foil, made with fiberglass and aluminized polyester, or a PVC coated fiberglass cloth. The outer liner shall be a polyester reinforced aluminized foil jacket.
4. Flexible ducts shall be U.L. Listed in accordance with U.L. 181 as a Class I insulated air duct, and shall comply with NFPA Standard 90A and 90B. Flexible ducts shall have a maximum flame spread of 25 and maximum smoke developed rating of 50.
5. Flexible ducts shall be suitable for operating temperatures of -20 up to 250 Deg. F.
6. Flexible ducts shall be suitable for negative pressures of minus one inch W.G. in sizes up to 16" in diameter; and positive pressures up to 10 inches W.G. for sizes up to 16" in diameter. Maximum operating duct velocity rating shall be a minimum of 4,500-5,500 feet per minute.
7. Maximum vapor transmission rating shall be 0.05 Perms as rated in accordance with ASTM-E-96.
8. Unless otherwise noted, the maximum length of flexible duct shall be limited to five feet (5').
9. Securement of flexible ducts to air devices shall consist of sliding the duct onto the air device collar or connector and securing it with plenum rated nylon or teflon panduit band on the inner liner which shall be U.L. rated for the application. Fold insulated outer vapor barrier jacket liner over the first band and secure with a second plenum rated panduit band. Make connection vapor tight with a vapor barrier seal using polyester reinforced aluminized duct tape that is two inches (2") wide, wrapped 2 times around the duct, or by the use of a fiberglass mesh wrapped in a similar fashion and coated with a vapor barrier coating, Foster's Vapor Safe 95-90 or 95-96 mastic or Childers CP-38. Coating must adhere to MIL-PRF-19565C with a permeance rating of less than 0.02 perms per ASTM-E-96, procedure B. No cloth backed duct tape is allowed. All fasteners, adhesives, and duct tape used shall be U.L. rated for the application. All duct tapes used shall be acrylic based.

2.2 ROUND LOW PRESSURE DUCT TAPS

- A. Provide round low pressure, systems operating at a maximum of two inches (2" inches) water gauge (W.G.) static pressure, duct taps to serve air devices where shown on the drawings and in accordance with details for these taps
- B. Duct taps shall consist of spin-in, or spin on, collar type manufactured fittings specifically made for commercial ductwork systems. Spin-in fittings shall be either the straight or conical type as shown and detailed on the drawings to include integral manual balance damper with locking device. Fittings shall be fabricated using continuous weld longitudinal seams. No riveted construction allowed.

- C. All spin-in fittings shall be made with hot dipped, G-60 or G-90, galvanized steel (per ASTM A 653) and be a minimum of 26 gauge in thickness for all sizes from 4" to 12" round. All sizes 14" to 20" round shall be a minimum of 24 gauge in thickness. Thicker gauges shall be provided on larger fittings as required per SMACNA and the Mechanical Code, where required.
- D. Provide plain or beaded ends for connection of duct work as required for the application. Crimped ends are not allowed.
- E. All ductwork systems are called out elsewhere in these specifications to be externally sealed to limit air leakage. These fittings may either be factory sealed (all seams sealed) or be sealed by the contractor in the field.
- F. All spin-in fittings shall also include integral manual balance dampers unless indicated otherwise. Damper options shall be as follows:
 - 1. All manual volume dampers shall be the butterfly type, using a single round damper blade and positive locking regulator damper hardware.
 - 2. Sizes 4"-12" round shall have a reinforced damper axis (not a continuous damper shaft) with 1/4" regulator and spring loaded, retractable bearings.
 - 3. Sizes 14" through 20" round shall have a minimum 3/8" continuous damper rod axis with nylon grommets installed at damper sleeve penetrations.
 - 4. Provide dampers, which shall include an extended threaded shaft that aligns with a sheet metal stand-off bracket (spot welded to the fitting) with the stand-off distance to be 2" to clear the thickness of any external duct wrap insulation. Coordinate stand-off dimensions with specified duct insulation thickness (only when thicker than 2"). Damper handle and wing nut to be fastened at the outside of the stand-off bracket.
 - 5. Provide premium optional balance dampers to include a 2" stand-off bracket, spot welded to the fitting, to include a 3/8" square shaft extended to the stand-off bracket, with U-bolt, nylon bushings, locking quadrant and handle.
- G. Acceptable Manufacturers:
 - 1. Flexmaster or equals by,
 - 2. Crown Company Products,
 - 3. Ductmate,
 - 4. Hercules Industries.

2.3 FIRE, SMOKE, AND COMBINATION SMOKE-FIRE DAMPERS

- A. Contractor shall furnish and install fire, smoke, and combination smoke-fire dampers in air passages, openings, and ductwork wherever shown on the Drawings, and as required by the local authorities having jurisdiction. Installations shall be in accordance with all applicable NFPA standards and the SMACNA Duct Manual. All dampers shall carry the U.L. Label and shall be installed such as to conform to conditions under which the U.L. Label was granted. All dampers shall be constructed and tested in accordance with the latest edition of U.L. Safety Standards 555 or 555S, as applicable. Provide sleeves, typically 12" in length minimum, for all dampers as required for the installation conditions encountered.
- B. Fire dampers shall be constructed in accordance with the recommendations of the NFPA and shall be of metal gauges required by the class of separation in each case.
 - 1. Interlocking curtain blade type fire dampers carrying the Underwriters' Label will be acceptable, except at locations where an operating type damper is required to meet local requirements, to meet sequence of operations indicated in

- Temperature Control Specifications, Section 23 0900, or to meet the limited spaces available.
2. Use Style "B" rectangular and style "CR" for round dampers such that blades are out of the air stream.
 3. For grille installations at fire rated partitions, use Style "B" thin line fire dampers or Style "G" integral sleeve type for grilles.
- C. Smoke dampers shall be designed for vertical or horizontal applications as encountered in accordance with NFPA 90A and meet the latest requirements of UL 555 S. Smoke dampers shall be installed in, or adjacent to, the smoke barrier; but in no case, more than 24 inches from the smoke barrier. Smoke dampers shall be a Ruskin Model SD35, 36, 37, or SDRS25 as applicable for the application. Frames shall be made of 16 gauge single piece galvanized steel hat shaped channel frames. Blades shall be 6" wide galvanized steel and be the triple V-groove or air foil type. Provide stainless steel jamb seals, silicone edge type blade seals where required for the classification, stainless steel sleeve bearings and linkages concealed in the frame. Leakage Class shall be Class 1, 2, or 3, as required, to meet the requirements specified elsewhere herein. Provide compatible electric actuator on all dampers, factory installed.
- D. Combination fire-smoke dampers shall be Leakage Class 1 dampers with electric, manually resettable, fuse link operated by 120 volt electric actuator furnished with the damper. Fire-smoke dampers shall be Ruskin FSD-60, or equal, with minimum 16 gauge galvanized steel hat channel shaped frames. Fire-smoke dampers shall be increased in size to maintain a minimum of 90 percent free area of the ductwork size indicated on the Drawings thru each fire-smoke damper. Leakage shall be Class 1, 2, or 3, as required, to meet the requirements specified elsewhere herein. Provide compatible electric actuator on all dampers, factory installed.
- E. Insulated all metal access panels, secured with sash locks, shall be installed to service all fire, smoke, and combination smoke-fire dampers. Access panels shall be identified with "FIRE DAMPER", "SMOKE DAMPER", or "SMOKE-FIRE DAMPER" stenciled thereon in a visible or conspicuous location. Removable flexible duct shall not be permitted as a means of damper access. Access shall be direct and shall not be obstructed by turning vanes or other duct accessories.
- F. General Requirements:
1. For "Ductmate" connections at fire, smoke, or combination smoke-fire dampers, do not use screw fasteners.
 2. Use four inch (4") draw band connections at round duct fire damper connections.
 3. Use blade dampers when the blade width exceeds 12 inches.
 4. Install vertical or horizontal mount dampers suitable for the application.
 5. Dampers shall be suitable for the maximum air system operating pressures expected to be encountered. Medium pressure ductwork is expected to operate at up to six inches (6") W.G.
 6. Use multi-section dampers where damper size openings are larger than single section maximum sizes.
 7. Fire, smoke and combination smoke-fire dampers shall be sized to provide for 100 percent of the ductwork size (minimum 95% free area) indicated on the Drawings through each damper.
 8. Provide 165 Deg. F. rated fusible links for fire dampers.
- G. Acceptable Manufacturers:
1. Ruskin, or approved equals by:
 2. Greenheck, or

3. Nailor, or
4. Prefco, or
5. National Controlled Air (N.C.A.), or
6. Air Balance, or
7. Pottoroff.

2.4 FLEXIBLE CONNECTIONS

- A. Where ducts connect to fans, including roof exhausters, flexible connectors shall be made that are fire-resistant, (up to 200 Deg. F.), waterproof, mildew-resistant and essentially airtight, and shall weigh approximately thirty ounces (30 oz.) per square yard.
- B. There shall be a minimum of one-half inch (1/2") slack in these connections, and a minimum of two and one-half inches (2-1/2") distance between the edges of the ducts for a total of three inches (3"). There shall also be a minimum of one inch (1") of slack for each inch of external static pressure on the fan system for medium pressure systems.
- C. Acceptable Manufacturers:
 1. Vent Fabrics "Ventglas", or approved equals by:
 2. Duro-Dyne.

2.5 ACCESS DOORS

- A. Furnish and install hinged, low leakage access doors in ductwork or plenums to provide access to all fire, smoke and combination fire - smoke dampers, mixed air plenums, automatic dampers, coils, filters, and elsewhere as detailed on the Drawings.
- B. Where the ducts are insulated, the access doors shall be double skin doors with a minimum one inch (1") of insulation in the door. The insulation shall have a minimum R-value of 5.0. Increase the thickness of the insulation as needed to comply. Where the access door is installed in non-insulated ductwork the access door shall be unlined sheet metal of the same gauge thickness as the duct.
- C. In no case shall access doors be smaller than eight (8") by eight inches (8"). Access doors shall be sized to permit testing or servicing of duct mounted components, such as, for coil cleaning, installation of control devices, resetting of fusible links, filter replacement, etc., as applicable and suitable for the application.
- D. Where duct access doors are above a suspended, normally non-readily accessible ceiling, such as plaster, gypsum board or spline type ceilings, Contractor, under this Section of Specifications, shall be responsible for the proper location, and furnishing of, ceiling access doors, or panels, to make duct access doors easily accessed through the ceiling system. Ceiling access doors, or panels, shall be rated, where applicable, to match the fire rating of the ceiling system penetrated. Ceiling access doors, or panels, shall be installed under other Sections of these Specifications. Ceiling access doors, or panels, shall be centered directly beneath duct access doors or immediately adjacent thereto when duct access is through the side of the duct.
- E. All access doors shall be fully double gasketed, door to frame and frame to duct, and include a sash type or compression latches for sizes under eighteen inches (18") by eighteen inches (18"). Use one (1) sash type latch per twelve inches (12") of height or width. Access doors 18" x 18" and larger shall have quarter turn handle latches. Provide one handle per 24" section, height or width, of door. As an example, provide two (2) handle type latches for a 48" tall access door.
- F. Provide a minimum of two (2) heavy loose pin hinges for each access door unless indicated otherwise herein. Piano style hinges will be an allowed substitute.

- G. Where the installation conditions prohibit suitable access with hinged access doors, then non-hinged access doors may be used in conjunction with a corrosion resistant cable or chain, of suitable length, attached to the access door and duct.
- H. For duct systems constructed to 2 inches W.G standards, or less, provide standard access doors meeting all requirements specified herein, which have a tested air leakage rating of less than 4.0 CFM at a test pressure of 2 inches W.G., and as manufactured by:
 - 1. Ventlok with hinges and No. 90 or No. 99 latches (less than 18" x 18"), or No. 100 or No. 140 latches (18" x 18" and larger), as applicable, or approved equals by:
 - 2. Ductmate, or
 - 3. Duro Dyne DDIAD-0806, or
 - 4. NCA Manufacturing ADH-T-1, or
 - 5. Pottorff HAD or CAD, or
 - 6. Nailor 08SH with HP Seal, or 0890, or
 - 7. Cesco Products HDG, or
 - 8. Ward Sandwich Style Access Doors, DSA or DDA, for round ductwork.

2.6 TURNING VANES

- A. Turning vanes shall be Harper double wall turning vanes fabricated from the same material as the duct.
- B. Turning vane front and back panels shall be securely locked together with adequate crimping to prevent twisting of vane. Vanes shall be capable of withstanding 250 pounds of tensile load when secured according to the manufacturer's instructions.
- C. Rails for mounting vanes shall have self-locking, friction fit tabs designed to facilitate proper alignment of vanes. Tab spacing shall be as specified in Figure 4-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible", Third Edition standard. Rail systems with non-compliant tab spacing shall not be accepted.
- D. Acoustical Turning Vanes shall be used in applications that require quiet operating systems. Mounting rails shall have friction insert tabs that align the vanes automatically. These shall only be required where designated on the Drawings.
- E. Approved Manufacturers:
 - 1. Ductmate Industries PRO-Rail Turning Vane or approved equals.

2.7 DUCT LINER

- A. Where indicated on the Drawings or specified herein, all rectangular ducts; except kitchen grease hood, kitchen dishwasher and fume hood exhaust ducts; shall be lined with Fiberglass mat faced duct liner in the thicknesses, type, and locations as indicated elsewhere herein. Internally insulate the first 10 feet of the supply and return ductwork at the split DX AC units and all the outside air ductwork serving the units.
- B. Kitchen grease hood exhaust, kitchen dishwasher exhaust, kitchen hood make-up air, and fume hood make-up air and other industrial type exhaust air ducts shall not be lined. Line all other general building exhaust air ducts within 10'-0" on each side of each in-line exhaust fan with one inch (1") thick liner. Roof mounted exhaust fan ductwork shall also be lined, one inch (1") thickness, but only for the first 10'-0" of ductwork from the roof curb toward the occupied space.
- C. All return, transfer, and relief air ducts shall be lined with one inch (1") thick duct liner.

- D. The liner insulation system shall be one and one-half inches (1.5") in thickness on all conditioned air, heated or cooled, as well as outside air intake ducts, and mixed air plenums to obtain a minimum R-value of 6.0 thereon.
- E. All ductwork systems are required to meet the most recent version of the International Energy Conservation Code.
- F. All duct liners shall comply with NFPA 90A and 90B and ASTM C 1071, Type I, for ducts and Type II for plenums (rigid liner). Liner shall consist of flexible, matt faced insulation made of inorganic glass fibers bonded by a thermosetting resin with an encapsulant edge coating, and shall be a rotary style duct liner product with a water repellant ingredient on the mat face to help keep moisture from penetrating the air stream surface. Other technical requirements shall include:
1. Be suitable for temperatures up to 250 Deg. F. per ASTM C 411.
 2. Be suitable for air velocities up to 6,000 FPM per ASTM C 1071 for Type I products and 5000 FPM for Type II products.
 3. Water vapor sorption shall be less than 3% by weight per ASTM C 1104.
 4. Air stream surface mat facing shall be tested with an EPA registered anti-microbial agent to aid in the prevention of fungal and bacterial growth. Mat face, as treated, shall not support the growth of mold, fungi, or bacteria per ASTM C 1338, ASTM G 21 and ASTM G 22.
 5. Does not exceed a Flame Spread of 25 and Smoke Developed and Fuel Contributed of 50 per ASTM E 84, NFPA 225, and UL 723.
 6. Conductance of 0.24 (R-value of 4.2) for a 1.5 PCF or 2.0 PCF duct liner at a 75 Deg. F. mean temperature per ASTM C177 for a one inch (1") thick product.
 7. Greenguard Compliant (Greenguard Environmental Institute).
 8. Noise Reduction Coefficient (NRC) of 0.70 or higher for a one inch (1") thick product and 0.80 for a two inch (2") thick product per ASTM C 423, type A mounting.
- G. All duct liners shall be able to be cleaned in accordance with the North American Insulation Manufacturers Association (NAIMA) "Cleaning Fibrous Glass Insulated Air Duct Systems Recommended Practices".
- H. Liner shall be applied to the inside of rectangular ducts and plenums with fire-resistant adhesive, Fosters 85-60, 85-65, or Childers CP-127, Hardcast "Seal-Tack" or Ward "Premium Duct Liner Adhesive", or approved equals only, complying with ASTM C 916, completely coating the clean sheet metal. All uncut joints in the insulation shall be "buttered" and firmly butted tightly to the adjoining uncut liner using the same fire resistant adhesive.
- I. Where a cut is made in the insulation for duct taps, etc., the "raw" edge shall be accurately and evenly cut and shall be thoroughly coated with a water based fire resistant adhesive. Where tears in the insulation occur coat such with the same adhesive (duct liner protective coating). Adhesives shall be Design Polymerics Duct liner Protective Coating (2510/2515/2540/2545), Ductmate Super Liner Seal (SLS), or approved equals only.
- J. On ducts over twenty-four inches (24") in width or depth, the liner shall further be secured with mechanical fasteners. Fasteners shall be Graham or Gemco weld pins. "Stick Clips", "Sheet Metal Clips", or other fasteners secured to the ducts by adhesive are not allowed. Fasteners shall be placed on a maximum spacing of eighteen inches (18") and shall be pointed up with fire-resistant adhesive. Fasteners shall not compress the insulation more than 1/8".
- K. Liner shall be accurately cut with all cut ends thoroughly coated with an approved liner edge coating adhesive so that when the duct section is installed, the liner shall make a

firmly butted and tightly sealed joint. Provide metal nosings securely installed over transversely oriented liner edges facing the air stream at all fan discharges, at access doors, and at any interval of lined duct preceded by unlined duct. This adhesive type shall be Duro Dyne "Dyn-O-Coat", or equal. This shall be an aerosol which is quick drying, flexible and tack free. Treat all exposed edges, butt seams, and inadvertent tears.

- L. Where rectangular ducts are lined and adjoins externally insulated rectangular ducts, the two insulations shall be overlapped not less than twenty-four inches (24").
- M. Dimensions given on the Drawings are inside air stream, free area, dimensions only and sheet metal sizes shall be increased in size to maintain these free area dimensions when liner is installed.
- N. All exposed ductwork shall be internally lined unless specifically indicated otherwise.
- O. Refer to Section 23 0700, Insulation, for further related requirements.
- P. Acceptable liner manufacturer shall be:
 - 1. Certainteed, Tough Gard R with enhanced surface.
 - 2. Knauf, Rotary Duct Liner E-M with Hydroshield.
 - 3. Owens Corning, Quiet R Acoustic Duct Liner, Type 150 or equivalent Duct Liner Board.
 - 4. Johns Manville, Linacoustic RC or R-300.

2.8 GRILLES, REGISTERS, AND DIFFUSERS

- A. Grilles, registers, ceiling outlets, diffusers and other air devices shall be as scheduled on the Drawings and shall be suitable for the intended use.
- B. Provide air devices with sponge rubber or soft felt gaskets at flanges where the devices mate up to a ceiling or wall surface.
- C. If a manufacturer other than the one scheduled is used, the sizes shown on the Drawings shall be checked for performance, noise level or criteria, face velocity, throw, drop, pressure drop, air diffusion, etc., before the submittal is made. Selections shall meet the manufacturers' own published data for the above performance criteria. The throw shall be such that the terminal velocity will be not more than 50 FPM or less than 25 FPM at the point of penetrating the occupancy zone. The occupancy zone is defined as six feet (6') above the finished floor and six inches (6"), or farther, from the walls.
- D. Noise levels shall not exceed those published in current ASHRAE Standards and Guidelines for the type of space being served (N.C. level) or that scheduled.
- E. Locations of outlets on Drawings are approximate and shall be coordinated with other trades to make symmetrical patterns and shall be governed by the established pattern of the lighting fixtures, structure and Architectural Reflected Ceiling Plan (RCP). Air devices shall have margins, frames, and sizes to be compatible with the ceiling and wall systems installed. All color and finishes are subject to final approval by the Architect.
- F. Where called for on the schedule, grilles, registers, ceiling outlets, diffusers and other air devices shall be provided with deflecting devices and manual dampers.
- G. Where indicated on the Drawings, provide a fire rated blanket on the back side of steel ceiling mounted air devices (supply, return, exhaust, etc.).
- H. Where indicated on the Drawings, provide an insulation blanket on the back side (all surface area) of ceiling mounted supply air devices to prevent condensation.

- I. All air devices shall be the standard product of the manufacturer, subject to review by the Architect. Acceptable manufacturers are:
 - 1. Titus, or approved equals only by:
 - 2. Krueger.
 - 3. Nailor.
 - 4. Metal-Aire.
 - 5. Carnes.
 - 6. Price Industries.

2.9 DRYER VENT EXHAUST DUCT SYSTEM

- A. Dryer vent exhaust duct work shall be constructed of minimum 26 gauge galvanized steel or aluminum sheet metal. Sheet metal gauge shall be increased in size to correspond to table in Paragraph 2.1C.3 for low pressure round ductwork.
- B. All duct work shall have a smooth interior finish and have interlocking fittings so that they do not require screw fasteners. No screw fasteners shall be used that puncture duct work. Support duct work at minimum four foot (4') intervals. All transitions shall be made outside of the duct wall. Refer to Section 504 of the 2009 International Mechanical Code (IMC) for additional requirements.
- C. For all dryer vent exhaust ducts concealed in building construction (i.e., in walls or above inaccessible ceilings), provide a permanent identification label or tag located within six feet (6') of the dryer connection, that lists the total equivalent length of the exhaust duct as defined by the IMC or the Manufacturer (Where longer than 35 equivalent feet note the allowed length of the dryer manufacturer). Label to be mounted to wall near exhaust duct and comply with equipment tag label requirements in Section 23 05 53.
- D. Provide termination caps or hoods with a backdraft damper but without screens. Refer to Drawings for details of terminations.

2.10 AIR FILTERS

- A. Provide appropriately sized and number of air filters for each piece of individual air handling equipment to include, but not be limited to, the following:
 - 1. Split DX A/C Units.
 - 2. Filter Return Air Grilles serving ducted return air systems where scheduled.
 - 3. Elsewhere as required to protect air type heat exchangers, such as warm air furnaces, or coil surfaces, such as duct mounted direct expansion coils.
- B. Medium efficiency air filters shall generally be two inches (2") thick, unless indicated otherwise and shall be the pleated media, disposable type, listed by Underwriters Laboratories as Class 2, with the following features:
 - 1. Air filters shall be rated in accordance with the most recent version of ASHRAE Standards 52.1 and 52.2, test methods as indicated herein, and shall conform to Section 7.4 of ARI Standard 850.
 - 2. Filter media enclosing frame shall be constructed of rigid, heavy duty, high wet-strength resistant, "beverage" board with diagonal support members on the air entering and air exiting sides. Expanded diamond grid media support, integral with frame, shall be chemically bonded to filter media at each pleat, to insure pleat spacing and stability. Pleated media shall be bonded to the inside of the frame to eliminate air bypass.
 - 3. Filter media shall be high performance, non-woven, reinforced cotton-poly, synthetic blend fabric formed in a V-shape.

4. Filters shall have the following performance data:

THICKNESS	SQUARE FEET MEDIA AREA TO ONE SQUARE FOOT FACE AREA	MINIMUM PLEATS PER LINEAL FOOT	INITIAL AIR RESISTANCE (INCHES W.G.)	RESISTANCE BASED ON AIR FLOW OF
One Inch (1")	2.4	16	0.25 (350 FPM)	1400 CFM
Two Inch (2")	4.3	15	0.28 (500 FPM)	1500 CFM

5. Filters shall be suitable for operation with varying velocities of up to 500 feet per minute (FPM) for 2" filters and 350 FPM for 1" filters.
6. Filters shall have a minimum efficiency MERV rating of 11 as tested in accordance with ASHRAE Standard 52.2-2007.
7. Acceptable Manufacturers:
- a. Camfil Farr, Inc., Model Aeropleat 11, or approved equals by:
 - b. Environmental Filter Corporation.
 - c. Eco-Air.
- C. All filters shall be standard sizes that are readily and locally available, in stock, through multiple over the counter sources without requiring special order. Standard acceptable sizes shall be 16" x 20" and 16" x 25".

2.11 ADHESIVES AND SEALANTS

- A. All adhesives and sealants used on this project must have a Volatile Organic Compound (VOC) content less than that listed in the current South Coast Air Quality Management District (SCAQMD) Rule 1168, and all sealants and fillers must meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.
- B. All adhesives and sealants shall meet the most current Leadership in Energy and Environmental Design (LEED™) requirements.

2.12 FIBERGLASS DUCTBOARD

- A. Fiberglass duct board of any type is not allowed on this project without exception.

2.13 ELECTRONIC BALANCING DAMPERS

- A. Where balance dampers are to be located above a hard ceiling, or in any inaccessible location, the contractor shall use electronic balancing dampers controlled with an Electronic Balancing Damper Positioner (EBDP) which opens and closes the damper and provides a visual indication of the damper position with a LCD meter.
- B. Each Remote Damper Assembly shall consist of a commercial quality damper actuated by a 12V DC motor with position feedback, a plenum rated cable with RJ-25 connectors on each end, termination options to control the damper from either a plenum, wall or ceiling location, and a hand held damper positioner that provides DC voltage to open and close the damper while displaying the damper position with the LCD position indicator meter.
- C. Each damper shall be either a round, rectangular, or High Efficiency Takeoff type damper, as applicable to the installation. Round dampers shall consist of a 20 gauge galvanized steel shell and blade with ½" plated steel damper shafts, and 12V DC Motor with position feedback. Rectangular dampers shall consist of a 20 gauge aluminum frame and blade, stainless steel slide, 18 gauge galvanized steel mounting plate for slip in installation, and 12V DC motor with position feedback. High efficiency takeoff dampers

shall consist of a galvanized steel takeoff with 20 gauge blade and 1/2" steel shafts, and 12V DC motor with position feedback. Dampers shall include oil impregnated bronze bushings. Damper actuators shall use less than 0.5 watts of power (20 mA), have a torque capability of 16 inch-pounds (maximum), and rotate the damper from 0 - 90 degrees in 12 seconds or less. Feedback shall occur via a proportional voltage signal. Provide low leakage damper blade seals.

- D. Electric Cables shall be plenum rated cable, have modular connectors and be available in lengths up to 1,000 feet. Length of individual cables shall be field verified to insure no field splicing of cables is required. One modular connector shall be attached to each motor and the other end shall include a RJ-25 modular connector that would be installed inside a plenum or at a wall or ceiling receptacle, to be coordinated with the architectural drawings (acceptable locations). Ceiling connections shall be the concealed type similar to Young Regulator Company (YRC) TP -301. Wall connections shall be the suitable for 1- 6 ports and be similar to YRC TP-Wall.
- E. The Positioner (EBDP) shall be used to control all remote electronic balance dampers installed on site by use of ceiling or wall mounted receptacles, a plenum connection or a combination of these options. The Positioner shall be self-contained and be a hand held device. Each positioner shall be provided with a high capacity long life lithium battery which shall be easily replaced in the field. Provide one (1) Positioner for each site or building to include one (1) spare battery for each positioner furnished. Positioner shall use a modular RJ-25 connector that plugs into the modular connector served by the 12V DC motor. The positioner battery shall drive the damper motor open and closed. The positioner shall also house the LCD display that provides precise damper position indication throughout the range of movement via a proportional voltage feedback signal from the motor.
- F. Acceptable Manufacturers:
 - 1. Young Regulator.
 - 2. Greenheck.
 - 3. Metropolitan Air Technology (MAT).
 - 4. Or other approved equals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all ductwork and equipment as indicated on the Drawings in full accordance with these specifications including foundations, hangers, supports, etc.
- B. Seal all ductwork as specified, pressure test and repair leaks.
- C. Install all duct mounted components such as heating coils, electric or water type, sound attenuators, air terminals, etc. in accordance with the manufacturer's recommendations.
- D. Should defects or installation deficiencies become apparent, or are observed, after the systems have been in operation, the deficient components shall be removed and replaced or reinforced as directed by the Owner's Representative.

3.2 CLEANING OF DUCT SYSTEMS

- A. Before the grilles or diffusers are installed, all fans and air conditioning units shall be operated and all debris and foreign matter shall be removed from the ducts.
- B. The air conditioning units shall be thoroughly cleaned, and the drain pans shall be thoroughly cleaned and flushed out with a hose; the filters shall be thoroughly cleaned and the grilles shall then be installed.
- C. Insure all duct openings are capped and sealed during construction when additions are not being made.

3.3 STATIC PRESSURE DUCT TESTING - LOW PRESSURE SYSTEMS

- A. All designated low pressure duct systems, shall be pressure tested by the Contractor, witnessed by the Testing, Adjusting, and Balancing (TAB) firm, according to the most current version of the SMACNA HVAC Air Duct Leakage Test Manual test procedures.
- B. Design pressure for testing low pressure duct work shall be two inches (2") of water gauge, unless indicated otherwise herein. All pressure tests shall be conducted under a positive pressure, even for systems intended to operate at negative air pressures such as exhaust systems.
- C. Test duct work from fan connection up to and including the hard sheet metal tap just prior to the final connection at each air device. Test in sections as required based on the Leakage Test Kit utilized. Use a United McGill Corporation LTK-S (small) or LTK-L (large) Leakage Test Kit with accessories as required to perform the test. This shall include a calibrated orifice tube with certified calibration chart, fan, and two U-tube manometers with connecting tubing.
- D. Tests shall be performed as soon as possible after the first section of duct work to be tested is installed to evaluate the quality of the installation early in the process to allow corrective actions to be taken before the entire installation is completed.
- E. Cap all open ends of duct systems to be tested for testing purposes. Make temporary openings for test equipment as required. Patch these to match new installation conditions when tests are complete and accepted per criteria stated herein. Generally, follow United McGill's procedures as published in their document titled "System Pressure Testing for Leaks", or the SMACNA Manual referred to herein.
- F. All ducts shall have been sealed as specified, during installation, and shall be sealed as a Seal Class "A" per SMACNA.
- G. Leaks that whistle or are excessive, as determined by the Owner's Representative, shall be repaired and the test repeated until such are eliminated.
- H. Maximum leakage rate of each system shall not exceed 5% of the design operating air volume; or, whichever is most restrictive, be equal to 6.0, or less, in accordance with the following equation (from International Energy Conservation Code, 2009):
$$\text{Leakage Rate} \leq 6.0 = F \times P^{0.65}$$

F = Measured Leakage Rate in CFM per 100 square feet of duct surface.
P = Test Static Pressure, In. W.G.
- I. Provide duct leakage test report summary for submission and review by the Owner's Representative. At least one test, preferably the first to occur, shall be witnessed by the Testing, Adjusting, and Balancing (TAB) Agent. Test Report Summaries shall include the following:

1. Cut sheets on test equipment used along with calibration sheet for orifice tubes used.
2. Drawing or diagram depicting portion of duct system tested. Indicate square footage of duct work in test section.
3. Indicate test pressure used in test, versus, construction class of duct installed.
4. Note allowed leakage in CFM for test section.
5. Indicate actual leakage recorded during the test.
6. All tests shall be repeated until the sections tested all pass the test per the criteria stated herein.

3.4 AUTOMATIC CONTROL DAMPERS

- A. Refer to Section 23 0900, Controls and Instrumentation.
- B. Install all temperature control modulating dampers under this section of the specifications, furnished in Section 23 0900.

3.5 FILTERS

- A. No air moving equipment may be operated at any time without filters being fully installed in equipment.
- B. Provide a minimum of three (3) spare sets of two inch (2") thick, medium efficiency, pleated media filters for all air handling and fan coil units, as well as for filter return air grilles where scheduled, in addition to manufacturer furnished filters specified elsewhere herein. Where other sections of these specifications require one inch (1") thick filters, or other types of filters, provide spare sets of matching thickness and type.
- C. Additionally replace filters during construction as directed by the Owner's Representative.
- D. Install one (1) new complete set of filters, as directed by the Test and Balance (TAB) Firm, just prior to performance of TAB work.
- E. Install one (1) new set of filters at "Substantial Completion" of the project.
- F. Where the minimum number of filter sets are not used for the aforementioned purposes, provide remaining filters to the Owner for maintenance stock.
- G. Document, in writing, when each filter change-out occurs.

END OF SECTION

SECTION 23 3400

EXHAUST AND SUPPLY AIR FANS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION

- A. Provide exhaust fans of the type, rotational speed, and arrangement indicated.
- B. Each fan shall be rated to deliver the capacity indicated in the tabulation on the Schedule against the external resistance of the system in which it operates.
- C. Provide high efficiency motors as specified in Section 23 0513 for motors one (1) horsepower and larger.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality.
- B. All equipment and materials shall be installed by experienced mechanics and as recommended by the fan manufacturer.
- C. All fans shall bear the AMCA and U.L. Labels. Capacity ratings shall be based on tests performed in accordance with the latest version of AMCA Standard 210 and Publication 211.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions together with fan curves.
- B. Shop Drawings: Submit in accordance with Section 23 0500.
- C. When equipment, other than specified, is proposed, the Contractor shall be completely responsible for electrical revisions necessitated. Submit listing of electrical feeder and conduit sizes, breaker sizes, and motor starter sizes for each item of equipment where motor sizes are required to be larger than specified to meet scheduled capacities.

1.5 PRODUCT HANDLING

- A. Cover and protect fans in transit and at site. Fans not properly protected and stored and which are damaged or defaced during construction shall be rejected. Cover all openings to prevent entrance of dirt and debris until final connections are made.
- B. Storage and protection of materials shall be in accordance with Section 23 0500.

PART 2 PRODUCTS

2.1 CENTRIFUGAL INLINE FANS

- A. Provide centrifugal in-line fans where indicated to meet the capacity requirements scheduled.

- B. In-line belt, or direct driven, centrifugal fans shall consist of a square steel housing, wheel, outlet guide vanes, fan shaft, bearings, drive assembly, motor and disconnect switch, mounting brackets, and accessories.
- C. Housing: Heavy gauge steel with primer and final enamel coats of paint, or galvanized steel, inlet and outlet flanges, support bracket adaptable to floor, side wall, or ceiling mounting, and access panels.
- D. Direct-Drive Units: Motor encased in housing out of air stream, factory-wired to disconnect located on outside of fan housing.
- E. Belt-Drive Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and heavy duty lubricated and permanently sealed, pillow block type fan bearings. Motor and drives shall be out of air stream. Drives to be sized for 150% of motor horsepower.
- F. Wheel: Aluminum, centrifugal blower, with non-overloading blades and tapered inlet. Wheel shall be statically and dynamically balanced.
- G. Accessories: The following accessories are required as indicated:
 - 1. Companion Flanges: For inlet and outlet duct connections.
 - 2. Fan Guards: Expanded metal in removable frame.
 - 3. Speed Control: For direct drive units, provide a variable speed switch with on-off control and speed control for 100 to 50 percent of fan air delivery.
 - 4. Disconnect switch unit mounted.
- H. Fan wheel, bearings, shaft, and drive components shall be serviced or removed without disturbing ductwork connections. Access doors shall be hinged or fully removable.
- I. Blower assembly shall bear the AMCA seal of approval for both air and sound.
- J. Acceptable manufacturers:
 - 1. Loren Cook.
 - 2. Acme.
 - 3. Greenheck.
 - 4. FloAire.
 - 5. Twin City Fans and Blowers.

2.2 FANS - POWER ROOF VENTILATORS (PRV-DOME AND UPBLAST TYPE)

- A. Fans shall be direct or belt-drive, down blast or up blast type, units as indicated, positively ventilated, permanently lubricated, have sealed motors and fan shafts with ball bearings. Belt drive units shall be complete with cast iron adjustable sheaves.
- B. Provide centrifugal all aluminum fans with static and dynamic balance and with capacities as scheduled on drawings, all tested, approved, rated and bearing the AMCA Seal of Approval.
- C. Provide all aluminum weatherproof housing, venturi throat inlet, bird screen and disconnect. Provide for concealed wiring such that power wiring does not penetrate roof but runs within curb.
- D. Curbs shall be minimum eighteen inches (18") high, made of galvanized steel and be insulated with minimum 1-1/2", 1-1/2 PCF density insulation, have continuous perimeter treated wood nailer and be furnished with a neoprene isolation strip to be placed on the top of the nailer. Provide sloped bottom of curbs to match roof pitch to allow for fans to be installed level.

- E. Furnish automatic backdraft dampers for all fans, unless indicated otherwise. Only up blast grease exhaust models will not have backdraft dampers.
- F. Provide SCR fan speed controller on direct drive motors with minimum stop for motor protection to be factory mounted on unit to be used for final air balance purposes.
- G. Acceptable manufacturers:
 - 1. Loren Cook.
 - 2. Greenheck.
 - 3. ACME.
 - 4. Penn.
 - 5. FloAire.
 - 6. Twin City Fans and Blowers.

PART 3 EXECUTION

3.1 DELIVERY AND PROTECTION

- A. Deliver all equipment to the site as indicated in Division 1.
- B. Contractor to perform installation and start-up to include installation of all accessories as required to make a complete and operating system.
- C. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost to the Owner.

3.2 EXHAUST FANS - INSTALLATION

- A. Install fans suspended from structure, or as indicated, and provide vibration isolation internally or externally as required, as specified herein, or as specified in other sections of these specifications.
- B. Suspended fans shall be set level with all thread rod from structure above.
- C. Field install motor and other accessories not factory installed.
- D. Verify operation of automatic motorized and backdraft dampers.
- E. Adjust fan drives and replace sheaves as required to obtain scheduled capacities as directed by the Test and Balance firm.

3.3 CLEAN-UP

- A. Clean all fans and components after installation is complete.
- B. Vacuum clean all debris from inside scrolls, on fan wheels and at drives.

END OF SECTION

SECTION 23 4323

POLAR IONIZATION AIR PURIFICATION SYSTEMS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 – General Requirements and reference documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other portions of work.

1.2 SYSTEM DESCRIPTION OF WORK

- A. Provide cold plasma air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.
- B. Each cold plasma array shall be "Needlepoint" type array.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality.
- B. All equipment and materials shall be installed by experienced mechanics and as recommended by the manufacturer.
- C. All cold plasma arrays shall be UL 86-2007 tested and U.L. listed. The technology shall have been tested to DO-160 by an independent lab and successfully passed all requirements for shock, vibration, EMF and line noise. Manufacturers not tested to DO-160 shall not be acceptable.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for ion generators including:
 - 1. Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.
 - 2. Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
 - 3. Performance data for each type of plasma device furnished.
 - 4. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 to validate acceptable indoor air quality at the quantity of outside air Scheduled (when projects are designed with outside air reduction).
 - 5. Product drawings detailing all physical, electrical and control requirements.
 - 6. Statement on the manufacturer's letterhead stating that the technology contains no titanium dioxide (TiO₂).
- B. Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.
- B. Store in original cartons and protect from weather and construction work traffic.
- C. Store indoors and in accordance with the manufacturers' recommendation for storage.

1.6 WARRANTY

- A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of eighteen months after shipment or twelve months from owner acceptance, whichever is longer.

PART 2 PRODUCTS

2.1 BI-POLAR IONIZATION COLD PLASMA GENERATORS

- A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.
- B. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.
- C. The Bi-polar Ionization system shall be capable of:
 - 1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
 - 2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
 - 3. Capable of reducing static space charges.
 - 4. Effectively reducing space particle counts.
 - 5. When mounted to the air entering side of a cooling coil, keep the cooling coil free from pathogen and mold growth.
 - 6. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:
 - a. MRSA - >96% in 30 minutes or less
 - b. E.coli - > 99% in 15 minutes or less
 - c. TB - > 69% in 60 minutes or less
 - d. C. diff - >86% in 30 minutes or less
 - e. Noro Virus -> 93.5% in 30 minutes or less
- D. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable. Ionizers with positive and negative output (DC type) shall not be acceptable. All ionizers provided shall be AC type ionizers with one electrode pulsing between positive and negative.
 - 1. Air exchange rates may vary through the full operating range of a constant Volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
 - 2. Velocity Profile: The air purification device shall not have maximum velocity profile.
- E. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.
- F. Equipment Requirements:
 - 1. Electrode Specifications (Bi-polar Ionization):
 - a. Each alternating current (AC) Ionization Bar with Bi-polar Ionization output shall include a minimum of sixteen 316 medical grade stainless

steel ion needles per foot of coil face width shall be provided. The entire cooling coil width shall have equal distribution of ionization across the face. Systems without ion needles at least 0.75" apart shall not be acceptable. The plasma electrode shall require no more than one inch in the direction of airflow for mounting. All hardware required for mounting shall be provided by the air purification manufacturer except self-tapping screws for the power supply. Bi-polar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, and performance output reduction over time, ozone production and corrosion. Plasma generators and bars with recessed needles shall not be acceptable.

- b. Electrodes shall be energized when the main unit disconnect is turned on.
- c. The ionization output shall be a minimum of 35 million ions/cc per inch of cooling coil width as measured 1 inch from the cold plasma needles.
- d. Ionization bars shall be provided with magnet mounting kits to prevent penetration into cooling coils.

G. Air Handler Mounted Units:

- 1. Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to 24V control transformer power in the unit provided by the air purification manufacturer. Each plasma generator shall be designed with an aluminum casing, liquid tight flexible conduit and a high voltage quick connector.

H. Plasma Requirements:

- 1. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.
 - a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 24VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.
 - b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced (AC Ionizers only are acceptable). Imbalanced levels shall not be acceptable.
 - c. Ionization output from each electrode shall be a minimum of 35 million ions/cc when tested at 1" from the ionization generator. The ionization bar shall provide 35 million ions/cc per inch of bar over the entire width of the ionization bar. Bars with needles spaced further apart will not be acceptable.
- 2. Ozone Generation:
 - a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 867-2007 with respect to ozone generation.

I. Electrical Requirements:

- 1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical

service of 24 VAC, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

J. Control Requirements:

1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset.
2. The ionization system shall be provided with a stand-alone, independent ion sensor designed for duct mounting to monitor the ion output and report to the BAS system that the ion device is working properly. The control voltage to power the ion sensor shall be 12VDC or 24VAC to 240VAC and draw no more than 150mA of current. The sensor shall provide dry contact status to the BAS.
3. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown on the plans. The contractor shall follow all manufacturer IOM instructions during installation.
4. A fiberglass NEMA 3R panel with Plasma On/Off Indicator Light (interfaced with stand-alone ionization detector), Ionization Output On/Off Indicator Light and an On/Off Illuminated Switch shall be provided to house the power supply.

K. Acceptable Manufacturers:

1. Global Plasma Solutions.
2. Plasma Air.
3. Phenomenal Aire

PART 3 EXECUTION

3.1 DELIVERY & PROTECTION

- A. Deliver all equipment to the site as indicated in Division 1.
- B. Contractor to perform installation and start-up to include installation of all accessories as required to make a complete and operating system.
- C. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost to the Owner.

3.2 TESTING

- A. Provide the manufacturers recommended electrical tests.

3.3 COMMISSIONING & TRAINING

- A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION

SECTION 23 8123

SPLIT DIRECT EXPANSION TECH/AV ROOM AIR CONDITIONING UNITS

(PRESS BOX)

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections, as applicable. Refer to other Divisions for coordination of work with other trades as required.

1.2 SYSTEM DESCRIPTION

- A. Provide Ducted Air Conditioning units with remote air cooled condensers to include all accessories as specified herein with hangers, supports, refrigerant piping, controls, power and control conduit and wiring and all appurtenances necessary to make a complete and operational system.
- B. Include factory authorized representative start-up and training services. Complete all start-up reports in legible format to be included in close-out documentation.
- C. Install all refrigerant piping, fittings, and refrigerant specialties to include an operating charge of refrigerant and oil. Refer to Section 23 23 00, Refrigeration Piping.
- D. These units are intended for 24 hour a day air conditioning of generally high sensible only heat loads with relative humidity control capabilities.

1.3 QUALITY ASSURANCE

- A. The Ducted Air Conditioning Units and remote condensers shall be the factory assembled type. Space allocations on the drawings are made on the basis of this unit manufacturer. If the Contractor elects to furnish units which are the product of another specified manufacturer not scheduled on plans, it shall be the Contractor's responsibility to demonstrate that the units will fit the available space in each case and still provide room to install all piping and ductwork and to properly maintain and service all units.
- B. All units shall be rated in accordance with applicable AHRI standards and shall be supplied with a CSA or ETL listing according to U.L. Units shall be factory tested before shipment to the project site.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions to include dimensional drawings, capacity data, illustrating all accessories provided, piping connections, refrigerant piping routing, matched capacities at design conditions, and control and power wiring schematics. Submit fan curves for all fans.
- B. Shop Drawings: Submit in accordance with Section 23 05 00.

1.5 PRODUCT HANDLING

- A. Cover and protect materials in transit and at site. Materials not properly protected and stored and which are damaged or defaced during construction shall be rejected.
- B. Storage and protection of materials shall be in accordance with Section 23 05 00.

PART 2 PRODUCTS

2.1 DUCTED ABOVE CEILING TECH/AV ROOM A/C UNITS

- A. Ducted Above Ceiling A/C Units have split condensers, fully factory-assembled units, with capacities as scheduled on the Drawings and characteristics as specified herein. Units shall be designed for being supported from structure over a drop-in ceiling system.
- B. Cabinet and chassis shall be constructed of heavy gauge galvanized steel and designed for easy installation and service access from one side and bottom of unit only. Provide mounting holes factory attached to cabinet. Cabinet insulation shall ASHRAE 62.1 and be tested in accordance with UL 181 to inhibit mold growth.
- C. Air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning sleeve bearings, and lifetime lubrication. Fan motor shall be permanent-split capacitor, high efficiency type, equipped with two speeds for air flow modulation and for precise dehumidification control (low speed).
- D. Furnish a return air filter box with hinged filter access and 1" duct flange on the return air connection to the unit. Additionally, provide a 1" duct flange for the supply air discharge connection. Provide filters with unit which shall be rated at MERV 11 efficiency based on ASHRAE 52.2.
- E. Control system shall be microprocessor based. Provide a wall-mounted control enclosure to include a 2 line 16 character LCD custom display providing a continuous display of operating status and alarm conditions. An eight (8) key membrane keypad shall be provided for setpoint/program control with unit on/off and fan speed indication located below the display. Each unit shall be provided with only controls that shall be capable at monitoring unit start/stop or alarm status.
- F. An automatic restart feature shall automatically restart the unit after a power failure.
- G. The temperature controls shall have two temperature control setpoints, one (1) for cooling and one (1) for heating functions, as applicable, with a minimum 2 Deg.F. differential (dead band) between them. The controls shall automatically switch from cooling to heating modes, and vice versa, based on return air conditions. The temperature control setpoint range shall be 65 Deg.F. to 85 Deg.F. with an initial cooling set point of 72 Deg.F., and heating set point, as applicable, of 70 Deg.F. Sensitivity of temperature control shall be from 1 to 5 Deg.F.
- H. Control System shall be programmable on a daily basis or on a 5 day/2 day program schedule. It shall be capable of accepting 2 programs per day. The control system shall include the capabilities to calibrate the temperature and humidity sensors and allow for adjustment of the sensor response delay time from 10 to 90 seconds. The control system shall also be capable of displaying temperature values in Deg.F. or Deg. C. Controller shall be equipped with BacNET or Mod BUS interface protocol to allow for monitoring by Building Energy Management System.
- I. An LCD display shall provide an on/off, fan speed, operating mode (cooling, heating, humidifying or dehumidifying) and current day, time, temperature and humidity (as applicable) indication. An auto change-over panel with LCD screen shall be provided and programmed to perform lead-lag operation between two units.
- J. The space temperature and relative humidity sensor, as applicable, shall be remotely mounted on a wall, integral with the LCD display, and shall be connected to the unit by continuous shielded cable in a length suitable to prevent the use of splices. Similarly, provide a continuous shielded cable to run from the indoor unit to the remote outdoor air cooled condenser.

- K. Where scheduled, furnish a unit mounted steam generating humidifier complete with disposable canister, supply and drain valves, steam distributor and related electronic controls. The need to change the canister shall be annunciated on the LCD controls display.
- L. Evaporator coil shall be minimum 3 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of 400 feet per minute. Refrigerant flow shall be controlled by an externally equalized thermostatic expansion valve. Coils shall be provided with a stainless steel drain pan. Refrigerant used shall be R-407C, 410A, or another non-ozone depleting refrigerant.
- M. Refrigeration system shall consist of a hermetic compressor (mounted on vibrating isolating grommets), high pressure safety switch, a refrigerant sight glass, moisture indicator, filter drier, evaporator coil, condenser coil, and externally equalized expansion valve.
- N. Remote air cooled condenser coil shall be constructed of copper tubes and aluminum fins and be served with a direct-drive propeller-type fan. All components shall be factory assembled, charged with refrigerant, sealed and be capable of being connected to the evaporator section using pre-charged refrigerant line sets. Condenser shall be designed for 105 Deg.F. ambient conditions and be capable of operation down to 0 Deg.F. ambient.
- O. Furnish an optional condensate pump, where scheduled, which shall have the capacity of 5 gph, or twice the anticipated condensate load, at 20 ft. of head. It shall be complete with integral dual float switches, pump, motor assembly, check valve and reservoir. An overflow, high level, shut-off switch shall de-energize unit and cause the controls to go into alarm.
- P. Provide a factory installed non-fused disconnect switch to allow indoor unit to be turned off for maintenance.
- Q. Acceptable Manufacturers shall be
 - 1. Liebert.
 - 2. APC.
 - 3. Data Air.

PART 3 EXECUTION

3.1 DELIVERY AND PROTECTION

- A. Deliver all equipment to each site as indicated in Division 1.
- B. Perform installation and start-up to include installation of all accessories as required to make a complete and operating system.
- C. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost.

3.2 TECH/AV ROOM A/C UNITS

- A. Install Ducted Computer Room air conditioning units in accordance with manufacturer's installation instructions. Suspend units plumb and level, firmly anchored to all thread rod supports in locations indicated, while maintaining manufacturer's recommended clearances.

- B. Install and connect electrical devices furnished by manufacturer, but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical systems installer. Include installation of shielded cabling in conduit, for LCD control panel (includes sensors) and remote air cooled condenser.
- C. Install and connect devices furnished by manufacturer but not specified to be factory mounted.
- D. Start-up units in accordance with manufacturer's start-up instructions and legibly complete manufacturers start-up report; submit with Close-Out Documents. Test controls and demonstrate compliance with specified requirements.
- E. Replace filters with a new set for Test and Balance Work.
- F. Lubricate all greaseable ball bearings with manufacturers suggested lubricant.
- G. Provide for positive gravity drainage of coil condensate from unit. Pipe full size of unit connection as detailed on the Drawings. Connect to condensate pump to discharge piping, as applicable, and terminate in approved location where shown.
- H. Adjust fan drives as required to obtain scheduled capacities as directed by the Test and Balance firm.
- I. Verify correct rotation of fan and wiring of motor and unit.

3.3 CLEAN-UP

- A. Clean coils and condensate pans after installation of Air Conditioning Units is complete.
- B. Clean all debris from inside Air Conditioning Unit casings and other fan casings.

END OF SECTION

SECTION 23 8128

SPLIT DIRECT EXPANSION AIR CONDITIONING UNITS WITH ELECTRIC HEAT

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other trades as required.

1.2 SYSTEM DESCRIPTION

- A. Work shall include installing remote air-cooled condensing units, direct expansion (DX) cooling coils, and indoor blowers units with electric heating coils where indicated on the Drawings to meet scheduled capacities. Condensing units shall be matched with indoor direct expansion cooling coils mounted with horizontal or vertical blower sections.
- B. Contractor shall connect all piping, refrigerant specialties, required controls, field installed accessories, appurtenances, insulation, hangers, supports, foundations, etc. to make a complete and operational system.
- C. Refer to Section 23 2300, Refrigeration Piping.

1.3 QUALITY ASSURANCE

- A. All equipment and materials shall be new and of the best quality complying with all standards specified herein.
- B. All equipment and materials shall be installed in a workmanlike manner by experienced mechanics and as recommended by the equipment manufacturer or as detailed.
- C. All products shall meet the most current version of the International Energy Conservation Code (IECC).
- D. All air handling unit electrical equipment shall be U.L. Listed.
- E. All coils shall be A.H.R.I. Rated for the application listed in accordance with AHRI Standard 410.
- F. All fans shall be rated in accordance with the Air Moving Council Association (AMCA), and bear the label thereof.
- G. All condensing units shall meet the Energy Star® guidelines for energy efficiency.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and installation instructions and method for the configuration of equipment proposed, including wiring diagrams, piping connections, sizing and other descriptive literature necessary to evaluate the Submittals for compliance with specifications.
- B. Include matched combination ratings for condensing units and indoor coils to account for refrigerant line routing and length of run.
- C. Shop Drawings: Submit in accordance with Section 23 0500.

1.5 PRODUCT HANDLING

- A. Deliver all equipment to the site where it shall be covered and protected. Material not properly protected and stored and which is damaged or defaced during construction shall be replaced at no cost to the Owner.
- B. Storage and protection of materials shall be in accordance with Section 23 0500.

1.6 INSTALLATION, OPERATION, AND MAINTENANCE BROCHURES

- A. Furnish all installation manuals required by a qualified mechanical system installer for proper installation of equipment. Manuals shall be provided with equipment and be attached thereto.
- B. Complete bound Operating and Maintenance Brochures shall be submitted a minimum of 30 days prior to completion of construction.

PART 2 PRODUCTS

2.1 AIR COOLED CONDENSING UNITS

- A. Furnish air cooled condensing units, as scheduled on the Drawings. Brass service valves with refrigerant line fittings and service ports shall be located on the exterior of the unit. Each unit shall be fully assembled and tested at the factory. It shall be designed for use with Refrigerant 410a.
- B. Capacities shall be as scheduled, with submitted equipment capacities based on combination ratings for the matched indoor coil, condensing unit, blower, and installation conditions shown on the Drawings including accounting for refrigerant line losses.
- C. Condensing coils shall be of non-ferrous (copper) construction above a nominal 5 ton capacity and aluminum or copper below five (5) tons. Aluminum coils shall be warranted for five (5) years. Coils shall have aluminum plate fins, mechanically bonded to the coil tubes. Coils shall be provided with the manufacturer's furnished, field installed, heavy duty condenser coil air inlet hail and vandal guards/grilles.
- D. Units shall be furnished with direct driven, propeller-type condenser fans arranged for vertical air discharge. Condenser fan motors shall have inherent thermal overload protection, shall be the permanently lubricated type, and be resiliently mounted. Each fan shall have a discharge corrosion resistant safety guard. Motors shall be the totally enclosed fan cooled type (TEFC) and permanent-split-capacitor type.
- E. Compressors shall be of the welded-hermetic type with internal vibration isolation. Compressors shall be single stage. Compressor motor shall have both thermal and current sensitive overload devices, and start assist capacitance devices shall be standard on single phase units, where the refrigerant line length exceeds 50 feet in total equivalent length (one way). Compressors shall be equipped with a crankcase heater and have internal high-pressure protection.
- F. Controls and protective devices shall include a liquid line low-pressure switch, suction line accumulator, pressure relief device, and anti-short cycle timer. Control wiring terminal board shall be designed to match indoor unit terminal board and accessory thermostat terminals for standardized point-to-point connectors.
- G. Accessories shall include Solid-State Time Guard, Liquid Line Filter Dryer, sight glass, Flare-to-Compatible Coupler, crankcase heater (for low ambient (below 55 Deg.F.), long line or hard start kit (over 50 feet) applications, evaporator freeze protection thermostat (low ambient (below 55 Deg.F.) operation), winter start control (low ambient applications

and with low pressure switch), and a head pressure controller to allow operation down to 20 Deg.F. ambient temperature.

- H. Air cooled condensing units shall carry the full one (1) year warranty on the entire unit, plus, an additional four (4) year parts only warranty on the motor compressor unit.
- I. All condensing units shall have a minimum SEER and or EER rating as noted on the drawings, at combination rating with matched DX-coil and blower section.
- J. Acceptable Manufacturers:
 - 1. Trane.
 - 2. Lennox.

2.2 AIR CONDITIONING UNITS

- A. Direct Expansion (DX) Cooling Coils:
 - 1. Furnish and install A/C Unit Direct Expansion (DX) cooling coil modules to meet capacities scheduled to be matched with condensing units as detailed and shown on the Drawings. Units shall be upflow or horizontal design as indicated on the Drawings.
 - 2. Unit enclosures shall be fully insulated and constructed of cold-rolled steel, bonderized and finished with baked enamel.
 - 3. Cooling coils shall be constructed with aluminum plate fins mechanically bonded to non-ferrous copper tubing with all joints brazed. Coils shall have factory installed refrigerant line fittings which permit mechanical connections and condensate pans with primary and auxiliary drain connections on each side. Coil pressure drop scheduled shall not be exceeded. Include factory installed expansion and reversing valve.
 - 4. Condensate pan shall be made of 18 gauge galvanized, or Type 304 stainless steel, and be insulated to prevent condensation.
 - 5. Coil modules shall be as manufactured by:
 - a. Trane.
 - b. Lennox.
- B. Provide horizontal direct expansion fan/blower assemblies matched to direct expansion (DX) coils and condensing units to meet scheduled capacities as indicated on the Drawings. Units are horizontal in design; refer to the Drawings for configuration.
- C. Unit enclosures shall be insulated with one inch (1") thick, R value of 6.0, insulation and have panels constructed of cold rolled steel, bonderized and finished with baked enamel, or may be made of embossed galvanized steel. Large front service access panels shall provide easy access to all components. Provide supply air duct collar.
- D. Furnish side access flat filter racks, capable of accepting one or two inch (1" or 2") thick filters. Two inch (2") thick (MERV 11) filters will be used in this application. Furnish filters and spare media same as for constant volume air handling units. All filters shall be standard filter sizes of all filter manufacturers. Filters rack shall be external to unit and shall be equal to Accommodator Short ACG.
- E. Fans shall be the forward curved type with double inlet, be mounted on a motor shaft, and be dynamically and statically balanced. Provide multi-speed (min. 2 speed), Electrically Commuted (ECM) fan motors. Motors shall be factory lubricated, have internal overload protection, and be resiliently mounted. Fan motor assembly shall slide out for service. Fans shall be statically and dynamically balanced and be of indicated capacities. Fan wheels shall be constructed of a minimum of 22 gauge galvanized steel

and be forward curved design. Furnish permanently lubricated long life heavy duty ball bearings. All motors shall be provided with thermal overload protection.

- F. Provide for factory or field installed electric heaters. Heaters shall have the capacities, electrical characteristics, and stages as scheduled on the Drawings. All heaters shall be ETL approved and have single point electrical power wiring terminal blocks. Provide a hinged service access panel.
- G. Electric Heaters: Electric heat modules shall be installed in unit. Electric heater elements shall be constructed of heavy-duty nickel chromium elements internally connected for the scheduled electrical requirements. Staging shall be achieved through the unit control processor. Each heater package shall have automatically reset high limit control operating through heating element contactors. All heaters shall be individually fused from factory, and meet all NEC requirements when properly installed. Power assemblies shall provide single point connection. Electrical heat modules shall be UL listed or CSA certified.
- H. Unit electrical connections shall consist of suitable openings in the cabinet for routing of all utility connections for side power supply connection. The base unit shall contain a terminal strip in the control compartment to allow for terminal-to-terminal connection of thermostat (temperature sensor) and field installed accessories. Electrical controls shall be complete with self-contained low voltage control circuit protected by an automatic reset device. All unit power wiring shall enter the cabinet at a single factory pre-drilled location designed for single point electrical service.
- I. Acceptable Manufacturers:
 - 1. Trane.
 - 2. Lennox.

2.3 TEMPERATURE CONTROLS

- A. Under Specification Section 23 0900, Controls and Instrumentation, space temperature, and relative humidity, sensors, as applicable, shall be provided for field installation along with factory mounted and wired terminal unit controllers to control units.
- B. Each A/C unit shall have wiring terminals to receive signals from the Terminal Unit controller to receive 4-20 ma, or 0-10 volt D.C. as applicable, signals to stage on and off heat, modulate the indoor evaporator fan motor, energize compressor(s) stages, and modulation of the outside air dampers. Provide contacts to energize and de-energize the unit.

PART 3 EXECUTION

3.1 DELIVERY AND PROTECTION

- A. Deliver all equipment to each site. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost.
- B. During construction, take all steps necessary to protect equipment from damage or vandalism. All damage or vandalism shall be repaired at no cost to the Owner.

3.2 AIR COOLED CONDENSING UNIT INSTALLATION

- A. Install condensing units level on concrete pads where shown with vibration pads beneath unit legs.

- B. Route refrigerant piping and make connections to DX coils as recommended by the unit manufacturer.
- C. Furnish and install all refrigerant piping specialties including, but not limited to, thermal expansion valves, sight glasses, and filter dryers.
- D. Charge all refrigerant piping systems and equipment to maintain a fully operating refrigerant and oil charge.

3.3 AIR CONDITIONING UNITS

- A. Install air conditioning units level suspended from structure or mounted on housekeeping pads or mixed air plenums.
- B. Provide for positive gravity drainage of coil condensate. Pipe condensate full size of unit connection as detailed on the Drawings to include a P-trap. Verify proper drainage is attained from each unit.
- C. Remove all shipping restraints and unfasten any hold down fasteners.
- D. Verify correct rotation of fan and proper wiring of motor to include verification of proper line voltage and insuring actual motor amps does not exceed name plate amps.
- E. Lubricate all greaseable ball bearings with manufacturers suggested lubricant.
- F. Adjust belt tension and align belts to eliminate wear and excessive vibration per manufacturers recommendations.
- G. Verify starter (motor controller) motor overload heaters are sized within the nameplate motor amp range, i.e., a heater range of 8.0 - 9.0 amps would only be suitable for a motor within that range. A motor nameplate of 9.1 amps would need a different heater.
- H. Adjust fan drives as required to obtain scheduled capacities as directed by the Test and Balance firm to include one sheave and belt replacement, as required thereby.
- I. Lubricate all greaseable ball bearings with manufacturers suggested lubricant.
- J. Replace filters as specified in Section 23 3000. Keep the filter section loaded with filters at all times. Provide the new specified type just prior to the commencement of the Test and Balance work. Do not operate any unit without proper filters in place.
- K. Make piping connections so as not to interfere with future coil removal work, access door operation, filter removal and maintenance, or motor and drive maintenance.
- L. Provide power to units for operation for system balancing in sufficient time to perform TAB work prior to Substantial Completion.

3.4 OPERATING PROCEDURES AND REQUIREMENTS

- A. Three (3) copies of the operating and service instructions, in illustrated and bound form, shall be furnished by the manufacturer.
- B. At start-up, the equipment manufacturer shall furnish skilled personnel to supervise, check out performance, make any required adjustments, place all units in service, and instruct the Owner's personnel for a full period of two (2) HOURS per 15 units furnished. Additionally, start-up personnel shall fill out a start-up form, in legible handwriting or be typed, for each and every unit installed.
- C. The manufacturer of each item of equipment shall provide complete power and wiring diagrams to the Electrical and Control Systems installers, respectively. Drawings shall show all required external wiring and arrangements of electrical connections.

3.5 WARRANTY

- A. Transfer all Warranties to Owner for a full one (1) year period after the A/C systems are put into sustained operation to obtain building cooling effect for the benefit of occupancy by the Owner, Substantial Completion.
- B. Transfer any and all other warranties as applicable over to the Owner at the completion of construction, Substantial Completion, including extended four (4) year compressor warranties, as applicable, on refrigeration equipment.

END OF SECTION

SECTION 23 8246

UNIT HEATERS - ELECTRIC

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Comply with Division 1 - General Requirements and referenced documents.
- B. Comply with all other Division 23 Sections as applicable. Refer to other Divisions for coordination of work with other trades.

1.2 SYSTEM DESCRIPTION

- A. Scope of work shall include furnishing and installation of electric unit heaters and accessories as indicated and specified herein.
- B. All items of equipment shall meet or exceed scheduled capacities and shall be provided in quantities indicated.

1.3 QUALITY ASSURANCE

- A. All work shall comply with the most recent edition, with amendments of the local Building Code, Mechanical Code, Plumbing Code, Fire Code, and all other state and local codes or ordinances.
- B. All heaters shall be Underwriters Laboratory (U.L.) listed and shall be listed for the specific installation application.
- C. All equipment installations shall be installed in accordance with the National Electrical Code (NEC).
- D. The manufacturer of each type of equipment specified herein shall have a minimum of five (5) years operating experience with each heater type.

1.4 SUBMITTALS

- A. Indicate equipment, materials, quantities, sizes, installation details and any other descriptive literature necessary to fully evaluate submittals for compliance with these specifications.
- B. Provide power supply and control wiring diagrams suitable for use by an electrician and control wiring technician.
- C. Shop Drawings: Submit complete shop drawings in accordance with Division 1 and Section 23 0500.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Damaged, deteriorated, or wet materials shall be rejected and replaced.
- B. Take all measures necessary to protect equipment from damage or vandalism during construction. Any such damage discovered shall be cause for rejection of equipment, in which case the Contractor shall replace equipment at no cost to the Owner.

PART 2 PRODUCTS

2.1 ELECTRIC UNIT HEATERS

- A. Provide electric unit heaters which shall be complete packaged units with controls and accessories as specified herein to meet scheduled capacities as indicated on the Drawings.
- B. Units shall be furnished with a minimum 18 gauge, die formed, steel cabinet with a factory applied phosphate coating and baked enamel paint finish.
- C. Each unit shall have a direct drive fan motor with axial flow propeller blade fan. Fan motor shall be permanently lubricated with sealed bearings and internal overloads. Motor shall be the totally enclosed type rated for continuous heavy duty all angle operation and equipped with built-in thermal overload protection. Fan speed shall not exceed 1600 RPM.
- D. Electric heating elements shall be low temperature enclosed style metal sheath type. Elements shall be made of steel and monel and have a copper clad steel sheath and aluminum fins warranted for five (5) years. Elements shall have automatic reset thermal overload protection to shut down elements and fan if safe operating temperatures are exceeded.
- E. Units shall be provided with a control transformer to utilize a 24 volt control circuit (unless unavailable and then unit power single phase voltage shall be used) with fan time delay control to purge unit of excess heat after unit shut down, and an automatic high limit cut-out. Motor contacts shall be provided on three-phase units and all units larger than 5.0 KW.
- F. Units shall be furnished with wall mounting thermostat with Summer "Fan Only" switch, off switch, 65 Deg.F. to 90 Deg.F. range and heat position switch with number of stages to match scheduled heater.
- G. Provide mounting brackets for ceiling suspension or wall swivel mount suitable for the applicable installation condition or as indicated on the Drawings. Provide minimum two point threaded hanger connection, mounting sockets, on suspended units over 100 pounds in weight. Provide four point connections on units over 200 pounds in weight.
- H. Each unit shall be design-certified by Underwriters Laboratories and be UL listed and meet the requirements of the NEC.
- I. Supply air shall be drawn and discharged through an outward drawn venturi. Provide individual, adjustable, horizontal discharge air louvers with 30 Degrees downward stops to prevent complete shut-off of air flow.
- J. Heater shall be designed for a single electrical circuit, with elements, motor and control circuits subdivided with factory fuses to conform to the National Electric Code and Underwriter's Laboratory requirements. An access panel, with wiring diagram attached, shall be provided for access to electrical control circuiting and protective devices.
- K. Acceptable manufacturers:
 - 1. Q-Mark.
 - 2. Reznor.
 - 3. Trane.
 - 4. Modine.
 - 5. Emerson.
 - 6. Markel.
 - 7. BERKO.
 - 8. Indeeco

PART 3 EXECUTION

3.1 DELIVERY AND PROTECTION

- A. Deliver all equipment to each site as indicated in Division 1.
- B. All equipment shall be handled carefully to avoid damage and be protected from exposure to the weather and dirt. All equipment shall be examined upon delivery to the site and evidence of abuse, damage, or exposure to weather and dirt shall be grounds for refusal to accept individual pieces of equipment. Rejected items shall be replaced promptly at no cost to the Owner.
- C. Protect equipment during construction. Equipment damaged during construction prior to "Substantial Completion" shall be repaired or replaced at no cost to the Owner.

3.2 INSTALLATION

- A. Install and wire electric heating equipment and field installed appurtenances in full accordance with the recommendations of the unit manufacturers and as indicated on the Drawings.
- B. Provide power and control wiring as specified herein and as indicated on the Drawings.
- C. Follow all national and local codes related to the wiring of electrical heating devices.
- D. Verify correct installation and operation of each device installed.

END OF SECTION

SECTION 26 0000

ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. This Division and all Electrical sections contained hereinafter are subject to the Contract Documents of Division 1 whether attached or not, the various Divisions of the General Construction specifications and Division 23 of the Construction specifications and respective plans.
- B. All drawings, material in other Divisions of these specifications, addenda, and other pertinent documents are considered to be a part of the technical requirements of this Division of the specifications insofar as they are applicable.
- C. The material contained in this section shall be applicable to other sections of the specifications under this Division.

1.2 DEFINITIONS

- A. The following definitions shall apply to all sections of this Division:
 - 1. "Owner" shall mean the Owner or his designated representative.

1.3 SCOPE OF WORK

- A. This Division and all electrical sections of the specifications include all labor and material to complete all electrical systems as specified or shown on the Drawings.
- B. All work shown and specified shall be completely installed and connected in a workmanlike manner by mechanics properly qualified to perform the work required. All work shall be left in a satisfactory operating condition as determined by the Owner.
- C. Provide all services and perform all operations required in connection with or properly incidental to the construction of complete and fully operating systems with all accessories as herein specified or shown on the Drawings.

1.4 GENERAL

- A. The accompanying plans show diagrammatically the location of the various light fixtures, devices, conduits and equipment items, and methods of connecting and controlling them. It is not intended to show every connection in detail or all fittings required for a complete system. The Contractor shall carefully lay out his work at the site to conform to the conditions, to avoid obstructions and provide proper routing of raceways. Exact locations of light fixtures, devices, equipment, and connections thereto shall be determined by reference to the accompanying Plans, etc., by field measurement at the project, and in cooperation with other Contractors and Sub-Contractors, and in all cases shall be subject to the approval of the Owner. Minor relocations necessitated by the conditions at the site or directed by the Owner shall be made without any additional cost to the Owner.
- B. These specifications and the accompanying drawings are intended to describe and illustrate systems which will not interfere with the structures, which will fit into available spaces, and which will insure complete and satisfactorily operating installations. The Contractor shall be responsible for the proper fittings of his material and apparatus into the building and shall prepare installation drawings for all critical areas illustrating the installation of his work as related to the work of all other trades. Interferences with other trades or with the building structures shall be corrected by the Contractor before the work

proceeds. Should any changes become necessary due to failure to comply with these stipulations, the Contractor shall make such necessary changes at his own expense.

- C. All work shall be run parallel or perpendicular to the lines of the building unless otherwise noted on the Drawings.
- D. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide those details or special construction as well as to provide material and equipment usually furnished with such systems or required to complete the installation.
- E. The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability and that he will install his work in a satisfactory manner which is up to the best standards of the trade, complete and in good working order. If any of the requirements of the Drawings and Specifications are impossible to perform, or if the installation when made in accordance with such requirements will not perform satisfactorily, he shall report such occurrences to the Owner promptly after discovery of the discrepancy.
- F. No extra compensation will be allowed for extra work or changes caused by failure to comply with the above requirements.

1.5 INSPECTION OF THE SITE

- A. The Contractor shall visit the site, verifying all existing items indicated on the Drawings or specified, and familiarize himself with the existing work conditions, hazards, grades, actual formations, soil, conditions, and local requirements. The submission of bids shall be deemed evidence of such visit.
- B. All proposals shall take these existing conditions into consideration, and the lack of specific information on the Drawings shall not relieve the Contractor of any responsibility.
- C. All site visits shall be coordinated and scheduled with the Owner.

1.6 CUTTING AND PATCHING

- A. When cutting or patching becomes necessary to permit the installation of any work under this contract, or should it become necessary to repair any defects that may appear in patching up to the expiration of the guarantee, such cutting shall be done under the supervision of the Architect by the trade or Contractor whose work is to be disturbed. After the necessary work has been completed, damage shall be repaired by the Contractor or trade whose work has been disturbed. The cost of all such cutting and patching shall be paid by the Contractor requiring it to be done.
 - 1. Refer to Division 1 requirements.
- B. The Contractor shall do all necessary cutting and drilling of present walls, floors, ceilings, etc. for the installation of new work or for modifications to the existing work, but no structural work shall be cut unless specifically approved by the Architect. Patching and painting of services as required shall be by the General Contractor unless specified otherwise hereinafter.
- C. Locations of the various existing services, walls, and equipment to be altered, removed or connected to have been taken from plans of the existing building and other substantially reliable sources and are offered as a general guide only, without guarantee as to their accuracy. This Contractor shall examine the site and shall verify to his own satisfaction the location of all existing work and shall adequately inform himself as to their relation to

and effect on the work before entering into a contract. Submission of a bid shall constitute evidence that the submitting Contractor has inspected the site of the proposed work.

- D. The Contractor shall examine the existing building and plans for the new work and note the sizes of the openings available and shall be responsible for any cutting, patching, and alterations required to place new equipment in the building.
- E. Where walls, acoustical tile, suspended ceilings, etc., not scheduled to be re-worked or re-finished under the general contract are damaged during installation of new raceways, or other work, etc., such walls, tiles, etc., shall be replaced by the General Contractor at the expense of the Contractor.
- F. All damage done to the existing equipment, services, etc., incurred in the execution of this contract shall be repaired and restored to its original conditions by the Contractor.
- G. Holes through concrete shall be drilled with "Mole", or "Core-It", or equal diamond point hole saw.

1.7 DEMOLITION OF EXISTING EQUIPMENT

- A. Certain types of equipment will be retained by the Owner. The Owner will provide a list of all such salvage items. Before removal of any equipment, contact the Architect, who will determine the disposition. Equipment designated to be salvaged and remain the property of the Owner shall be carefully removed to prevent damage and delivered to a location on the site as directed by the Architect. Any equipment not retained by the Owner shall become the property of the Contractor and shall be removed from the premises.
- B. The Contractor shall visit the site and verify all outlets, devices, wall switches, light fixtures, etc., that are to be removed due to remodeling work and building additions.
- C. The attendant raceways, hangers, wiring, foundations, etc., of those items of existing equipment to be removed and not intended for reuse, shall also be removed in their entirety. No raceways, hangers, etc., shall be abandoned in place except those raceways concealed in existing walls or buried below grade.

1.8 CODE REQUIREMENTS

- A. All work shall comply with the provisions of these specifications, as illustrated on the accompanying drawings, or as directed by the Architect, and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies, and all authorities having jurisdiction over the work, or services thereto. In all cases where alterations to, or deviations from, the drawings and specifications are required by the authority having jurisdiction, report the same in writing to the Architect and secure his approval before proceeding. Upon completion of the work, furnish a statement from the inspecting authority stating that the installation has been accepted and approved. Provide complete utility service connections as directed, and submit, as required, all necessary drawings; secure all permits and inspections necessary in connection with the work, and pay all legal fees on account thereof. In the absence of other applicable local codes acceptable to the Architect, the National Electrical Code shall apply to this work.

1.9 RECORD DRAWINGS

- A. The Contractor shall, during the execution of the work, maintain a complete set of drawings upon which all locations of equipment, panels, and all deviations and/or changes in the work shall be recorded. All underground and overhead utilities provided under, or affected by, work of this Division shall be accurately located by dimensions. These "Record" drawings shall be delivered to the Architect in good condition upon the completion and acceptance of the work and before final payment is made.

1. Refer to Division 1 requirements.

1.10 RECORDS AND INSTRUCTIONS FOR OWNER

- A. The Contractor shall accumulate, during the project's progress, the following sets, prepared in neat brochures or packet folders and turned over to the Architect for checking and subsequent delivery to the Owner:
 1. All warranties and guarantees and manufacturer's directions on equipment and material covered by the Contractor.
 2. Approved equipment brochures, wiring diagrams and control diagrams.
 3. Copies of reviewed Shop Drawings.
 4. Operating instructions for all systems. Operating instructions shall include recommended maintenance procedures.
 5. Any and all other data and drawings required during construction.
 6. Repair parts lists of all major items and equipment including name, address, and telephone number of local supplier or agent.
- B. All of the above data shall be submitted to the Architect for review at such time as the Contractor makes application for final payment, but in no case less than two weeks before final observation.
- C. The Contractor shall also give not less than two (2) days of operating instructions, during the adjustment and testing period, to the Owner's operating personnel in order to familiarize them with the proper care and operation of the equipment. The written operating instructions referred to in above paragraphs shall be used as a basis for this on-the-job instruction.
 1. Refer to Division 1 requirements.

1.11 SHOP DRAWINGS AND SUBMITTALS

- A. The Contractor shall submit, to the Architect, shop drawings and catalog data on all equipment and materials designated on the Drawings and specified herein.
- B. The submittal will be reviewed for compliance with general requirements of design and arrangement only; it is not a contract document and acknowledgement of compliance does not relieve the Contractor from responsibility for performance of the work in compliance with all provisions and requirements of the Contract Documents. Job measurements and the coordination of all the dimensions for proper fit of all parts of the work and performance of all equipment supplies to meet specification requirements are and remain specific responsibilities of the Contractor.
- C. Shop Drawings shall be furnished by the Contractor for the work involved after receiving approval on the make and type of material and in sufficient time so that no delay or changes will be caused. This is done in order to facilitate progress on the job, and failure on the part of the Contractor to comply shall render him liable to stand the expense of any and all delays, changes in construction, etc., occasioned by his failure to provide the necessary detailed drawings. Also, if the Contractor fails to comply with this provision, the Architect reserves the right to go directly to the manufacturer he selects and secure any details he might deem necessary, and should there be any charges in connection with this, they shall be borne by the Contractor.
- D. The Shop Drawings submitted shall not consist of manufacturers' catalogues or tear sheet therefrom that contain no indication of the exact item offered. Rather, the submission on individual items shall designate the exact item offered.
- E. Shop Drawings submitted without indicating markings or Contractor's stamp shall not be reviewed and will be returned to the Contractor for correction of such discrepancies.

- F. The Shop Drawings are not intended to cover detailed quantitative lists of electrical specialties, and similar items, as the plans and specifications illustrate and describe those items, and it is the Contractor's responsibility to procure the proper sizes and quantities required to comply with the established requirements.
- G. Any Shop Drawings prepared to illustrate how equipment can be fitted into available spaces will be examined under the assumption that the Contractor has verified all the conditions, and obtained any approval thereon shall not relieve the Contractor of responsibility in the event the material cannot be installed as shown on those Drawings.
- H. Various material submissions of such as raceways, switches, panelboards, and related items shall be assembled in brochures or in other suitable package form and shall not be submitted in a multiplicity of loose sheets.
- I. Each Contractor shall process his submitted data to insure that it conforms to the requirements of the plans and specifications and that there are no omissions, errors or duplications.
- J. Shop Drawings shall be accompanied by certification from this Contractor that Shop Drawings have been checked by him for compliance with Contract Drawings.
- K. Samples of various products or mock-ups of particular details or systems may be required by various sections of this Specification.
- L. Refer to Division 1 requirements.

1.12 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

- A. Seal voids around ducts and pipes penetrating fire-rated assemblies and partitions using fire-stopping materials and methods in accordance with provisions in Division 1.

1.13 CONNECTION OF EQUIPMENT FURNISHED BY OTHERS

- A. All equipment furnished under other Divisions of the specification requiring service connections shall be connected by this Contractor. Materials and labor required for the connection of this equipment shall be furnished under Division 26. The respective supplier shall furnish proper roughing-in diagrams for the installation of these items. All items shall be roughed-in and connected in strict accordance therewith. All equipment requiring connection may not be specified herein, but may be included in other Division documents. This Contractor shall ascertain for himself all equipment so specified is included as part of his work.
- B. Refer to Section 26 05 23.

1.14 DRAWINGS

- A. The drawings show diagrammatically the locations of the various conduits, fixtures, and equipment, and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system. The systems shall include, but are not limited to, the items shown on the drawings. Exact locations of these items shall be determined by reference to the general plans and measurements at the building and in cooperation with other trades and, in all cases, shall be subject to the approval of the Architect. The Architect reserves the right to make any reasonable change in the location of any of this work without additional cost to the Owner.
- B. Should any changes be deemed necessary in items shown on the contract drawings, the shop drawings, descriptions, and the reason for the proposed changes shall be submitted to the Architect for approval.

- C. Exceptions and inconsistencies in plans and specifications shall be brought to the Architect's attention before bids are submitted; otherwise, the Contractor shall be responsible for the cost of any and all changes and additions that may be necessary to accommodate his particular apparatus.
- D. Lay out all work maintaining all lines, grades, and dimensions according to these drawings with due consideration for other trades and verify all dimensions at the site prior to any fabrication or installation; should any conflict develop or installation be impractical, the Architect shall be notified before any installation or fabrication and the existing conditions shall be investigated and proper changes effected without any additional cost.
- E. Titles of Sections and Paragraphs in these specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of material and/or work. The Architect does not assume any responsibility, either direct or implied, for omissions or duplications by the Contractor due to real or alleged error in the arrangement of matter in the Contract Documents.

1.15 COOPERATION

- A. All work under these specifications shall be accomplished in conjunction with other trades on this project in a manner which will allow each trade adequate time at the proper stage of construction to fulfill his work.
- B. Maintaining contact and being familiar with the progress of the general construction and the timely installation of sleeves and inserts, etc., before concrete is placed shall be the responsibility of this trade as will the installation of the required systems in their several stages, at the proper time to expedite this contract and avoid unnecessary delays in the progress of other contracts.
- C. Should any question arise between trades as to the placing of lines, ducts, conduits, or equipment, or should it appear desirable to remove any general construction which would affect the appearance or strength of the structure, reference shall be made to the Architect for instructions.

1.16 MATERIALS AND EQUIPMENT

- A. All materials purchased for this Project shall be new.
- B. Where specified product is not manufactured, manufacturer's current product meeting specification shall be substituted, subject to written approval of Engineer.
- C. Space allocations in electrical spaces are based on equipment scheduled in each case. Should the Contractor offer equipment of another make, he shall verify that such equipment will fit in the spaces allowed.
- D. Manufacturers' names are listed herein to establish a standard. The products of other manufacturers will be acceptable; if, in the opinion of the Architect, the substitute material is of a quality as good or better than the material specified, and will serve with equal efficiency and dependability, the purpose for which the items specified were intended.
- E. It is fully the Contractor's responsibility to assemble and submit sufficient technical information to fully illustrate that the material or equipment proposed for substitution is equal or superior as the Architect or his Engineer is under no obligation to perform the service for the Contractor. The proposal shall be accompanied by manufacturers' engineering data, specification sheet, and a sample, if practical or if requested. In no event shall a proposal for substitution be cause for delay of work.
- F. Should a substitution be accepted under the above provisions, and should the substitution prove defective or otherwise unsatisfactory for the intended service, within

the warranty period, the Contractor shall replace the substitution with the equipment or material specified, and on which the specifications required him to base his proposal.

1.17 STORAGE AND PROTECTION OF MATERIALS

- A. The Contractor shall provide his own storage space for protection and storage of his materials and assume complete responsibility for all losses due to any cause whatsoever. All storage shall be within the property lines of the building site, or as directed by the Owner's representative. In no case shall storage interfere with traffic conditions in any public or project thoroughfare.
- B. All work and material shall be protected at all times. This Contractor shall make good any damage caused, either directly or indirectly, by his workmen. He shall be responsible for safe handling of all electrical equipment and shall replace, without charge, all items damaged prior to acceptance by the Owner.

1.18 FOUNDATIONS

- A. Provide bases and foundations for all equipment specified or shown, unless specifically noted to the contrary. Foundations are generally to be built in compliance with the equipment manufacturer's shop drawings which have been approved by the Architect, or as directed by the Architect. Vibration or noise created in any part of the building by the operation of any equipment furnished or installed under this portion of the work will be objectionable. Take all precautions against same by isolating the various items of equipment from the building's structure, and by such other means as may be necessary to eliminate all excessive vibration and objectionable noise produced by any equipment installed; install all foundations, supports, etc., for raceway system and equipment with this end in view.

1.19 EXCAVATION AND BACKFILLING

- A. The Contractor shall do all necessary excavating and backfilling for the installation of his work. Trenches for underground conduits shall be excavated to required depths with bell holes provided as necessary to insure uniform bearing. Care shall be taken not to excavate below depth, and any excavation below depth shall be refilled with sand or gravel firmly compacted. Where rock or hard objects are encountered, they shall be excavated to a grade six inches (6") below the lowermost part of the conduit and refilled to grade as specified. After the conduit has been installed and approved, the trenches shall be backfilled to grade with approved materials, well tamped or puddled compactly in place. Where streets, sidewalks, etc., are disturbed, cut, or damaged by this work, the expense of repairing same in a manner approved by the Architect shall be a part of this contract.
- B. The Contractor shall bear sole responsibility for design and execution of acceptable trenching and shoring procedures, in accordance with State of Texas Regulations. On trench excavations in excess of five feet in depth, contractor shall pay a qualified engineer to prepare detailed plans and specifications directing Contractor in the safe execution of trenching and shoring. It is understood that trench safety systems constitute a means and method of construction for which the Architect, Engineer, and Owner are not responsible. Accordingly, such documents when prepared, shall be separately issued by Contractor's Consultant, independent of project Contract Documents.

1.20 SCHEDULE OF WORK

- A. The work under the various sections must be expedited and close coordination will be required in execution of the work. The various Contractors shall perform their work at such times as directed so as to insure meeting scheduled completion dates, and to avoid

delaying any other Contractor. The Architect will set up completion dates, schedule the times of work in the various areas involved, etc. This Contractor shall cooperate in establishing these times and locations and shall process his work so as to insure the proper execution of it.

1.21 CONTINUATION OF SERVICES

- A. The Contractor shall realize that the existing building must continue in operation during the construction period, except as the Architect and the Owner may direct otherwise.
- B. Under no conditions shall any work be done in the present building that would interfere with its natural use during the normal hours of occupancy, unless special permission is granted by the Owner. This is particularly applicable where new connections are to be made to present services or items of equipment in the building or where present equipment items in the building are to be relocated or modified in any way.
- C. Existing utility systems shall continue to function with a minimum of interruptions in service. This Contractor shall install any temporary lines, connections, etc., required to place and maintain the electrical systems in operation unless otherwise directed by the Architect.
- D. Arrange for and provide temporary electric and telephone services to the building where new construction conflicts with existing utility locations.

1.22 COMMISSIONING OF EQUIPMENT AND SYSTEMS

- A. The Contractor shall provide qualified personnel, as requested by the Owner and Architect, to assist in all on-site testing and commissioning of all equipment.

1.23 CLEANING UP

- A. The Contractor shall be responsible for cleaning up his work as specified in the General Requirements of these Specifications.

1.24 FINAL OBSERVATION

- A. Schedule: Upon completion of the Contract, there shall be a final observation of the completed installation. Prior to this observation, all work under this Division shall have been completed, tested, and balanced and adjusted in final operating condition and the test report shall have been submitted to and approved by the Owner.
- B. Qualified personnel representing the Contractor must be present during final observation to demonstrate the systems and prove the performance of the equipment.

1.25 CERTIFICATIONS

- A. Before receiving final payment, the Contractor shall certify that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these Specifications.
- B. Furnish, at the completion of the job, a final Inspection Certificate from the local inspecting authority.

1.26 GUARANTEE

- A. The guarantee provision of this specification requires prompt replacement of all defective workmanship and materials occurring within one year of final job acceptance. This includes all work required to remove and replace the defective item and to make all necessary adjustments to restore the entire installation to its original specified operating condition and finish at the time of acceptance. The Contractor shall also guarantee that

the performance of all equipment furnished and/or installed under this Division of the specifications shall be at least equal to the performance as called for in the specifications and as stated in the equipment submittals. Should there be indication that the equipment and installation is not producing the intended conditions, the Contractor shall make further tests as the Engineer may direct to demonstrate that the equipment installed meets the specifications. If there is indication that the equipment does not meet the specifications, the Contractor shall, at his expense, institute a program to demonstrate the adequacy of the installation. This program shall include all necessary testing and testing equipment. Should the Contractor not have the equipment or technical skill to perform the tests, it shall be his responsibility to provide recognized experts to perform the tests and shall provide certified laboratory tests, certified factory reports and work sheets, or other certified data to support results of any tests required.

- B. Refer to Division 1 requirements.

PART 2 PRODUCTS

NOT USED

PART 3 INSTALLATION

3.1 DEVICE MOUNTING REQUIREMENTS

- A. Mounting heights listed in Drawings shall be defined as measured from the centerline of the device or outlet box to finished floor elevation. Unless specifically noted otherwise on the Drawings. Device heights shall be in accordance with the Texas Accessibility Standards or the Americans with Disabilities Act.
- B. Where devices are grouped together, they shall be mounted at the same height.
- C. Coordinate all mounting dimensions with Owner's requirements and coordinate with architectural elevations and details.

3.2 HOUSEKEEPING PADS

- A. Provide 4 inch thick concrete housekeeping pad with 6 x 6 wire mesh and same cure strength as adjacent floor for all floor-mounted electrical equipment unless otherwise indicated on the Drawings. Provide dowel connections to floor if pad is not part of continuous floor pour.
 - 1. Provide inserts for anchor bolts as required for each floor-mounted piece of electrical equipment.
 - 2. Provide 3/4 inch chamfered edge at all exposed edges.
- B. Minimum pad dimensions shall be 6 inches greater than dimensions, including all protrusions, of equipment to be installed.
 - 1. Free-standing equipment: Center equipment on housekeeping pad.
 - 2. Equipment anchored to wall: Center equipment side-to-side on housekeeping pad and reduce pad front-to-back dimension by 3 inches.

END OF SECTION

SECTION 26 0501

ELECTRICAL DEMOLITION

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1- General Requirements and related documents.
- B. All sections of this Specification.

1.2 DESCRIPTION

- A. Contractor shall remove several items of materials and equipment under this section of the specifications. Equipment and materials to be removed shall be as indicated and noted on the Drawings and as required to facilitate the new installations.
- B. Provide labor, materials, equipment, tools and services as required to complete the demolition work indicated.
- C. Refer to Division 1 for "Schedule of Work".

1.3 DISRUPTION OF EXISTING FUNCTIONS

- A. Under no conditions shall any work be done in the present building that would interfere with its natural or intended use unless special permission is granted by the Owner.
- B. Disruptions: Maintain existing lighting, power, telephone, and other systems, and maintain existing functions in service, except for scheduled disruptions as allowed in Division 01, "General Conditions".
- C. Provide all temporary connections as necessary to facilitate the phasing of construction.

1.4 SALVAGE, DEMOLITION, AND RELOCATION

- A. It shall be the responsibility of the Contractor to remove and store those items of existing equipment as indicated on the Drawings to be removed. All items of equipment or fixtures removed shall be protected from damage insofar as is practical.
- B. These items shall be stored on site for a minimum of two (2) weeks unless indicated otherwise by the Owner's representative to allow for inspection by the Owner. Deliver, all items tagged to be retained by the Owner to a designated storage location on site or to the Owner's designated Service Center or Warehouse. All items not retained by the Owner shall be removed from the site by the Contractor at no additional cost to the Owner.
- C. The attendant conduit, hangers, foundations, etc., of those items of existing equipment to be removed, shall also be removed in their entirety. No hangers, etc., shall be abandoned in place.
- D. Relocations:
 - 1. Repair and restore to good functional condition materials and items scheduled for relocation and/or reuse and which are damaged during dismantling or reassembly operations.
 - 2. New materials and items of like design and quality may be substituted for materials and items indicated to be relocated, in lieu of relocation, upon approval of shop drawings, product data and samples.
 - 3. Remove carefully, in reverse to original assembly or placement, items which are to be relocated.

4. Protect items until relocation is complete.
5. Clean and repair and provide new materials, fittings, and appurtenances required to complete the relocation and to restore to good operative order.
6. Perform the relocation work in accordance with pertinent sections of the specifications, utilizing skilled workers.
7. Refer to Drawings for specific requirements of temporary services and relocated equipment and fixtures.
8. Coordinate with the General Contractor repairs required to bring finishes back to their original conditions after demolition and or installation of new equipment.

1.5 CLEAN UP

- A. Remove all debris, rubbish, and materials resulting from cutting, demolition, or patching operations from the work area on a daily basis.
- B. Transport materials and legally dispose of off-site.

PART 2 PRODUCTS

2.1 GENERAL

- A. Provide materials and equipment for patching and extending work as specified in individual sections or as indicated on the Drawings.

PART 3 EXECUTION

1.1 EXAMINATION

- A. Field Conditions: Demolition Drawings are based on non-invasive field observations and existing record documents. Report discrepancies in location, dimensions or quantity to Owner and Architect prior to disturbing existing installation.
- B. Abandoned Wiring: Verify that abandoned wiring and equipment serve only facilities scheduled for demolition.
- C. Existing Conditions: Commencing demolition means Contractor accepts existing conditions.

3.2 PREPARATION

- A. Demolition: Disconnect electrical systems in walls, floors, ceilings and equipment scheduled for removal.
- B. Project Coordination: Coordinate utility service outages with utility companies and schedule work with Facility management and Owner.
- C. Temporary Wiring: Provide temporary wiring and connections as necessary to maintain existing systems in service during construction.
- D. Schedule installation of temporary wiring and connections to eliminate hazard to installing personnel.
 1. When work must be performed on energized circuits or equipment, use qualified personnel experienced in such operations.
 2. Submit "hot work" policy information to Architect for review prior to performing work on any energized circuits.
- E. Electrical Service: Maintain existing system in operation until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission, in writing, from Owner prior to partially or completely disabling

system. Minimize outage duration. Make temporary connections as necessary to maintain service to areas unaffected by the scope of Work.

- F. Telephone Service: Maintain existing system in operation until new system is complete and has been accepted. Disable system only to make switchovers and connections. Obtain permission, in writing, from Owner, and notify the utility company, prior to partially or completely disabling system. Minimize outage duration. Make temporary connections as necessary to maintain service to areas unaffected by the scope of Work.
- G. Special Systems: Maintain existing systems in operation until new systems are complete and have been accepted. Disable systems only to make switchovers and connections. Obtain permission, in writing, from Owner prior to partially or completely disabling systems. Minimize outage duration. Make temporary connections as necessary to maintain service to areas unaffected by the scope of Work.
 - 1. The following systems will be affected by the scope of Work:
 - a. Fire Alarm System
 - b. Public Address System
 - c. Security System
 - d. Data System

3.3 DEMOLITION AND EXTENSION OF EXISTING WORK

- A. General: Demolish and extend existing work as indicated or described in the Drawings and Specifications.
 - 1. Lighting fixtures and electrical distribution equipment shall be salvaged for possible re-installation as directed by the Owner and Architect.
- B. Wiring: Remove abandoned wiring and cables to source of supply or termination.
- C. Raceways:
 - 1. Remove exposed abandoned conduits and raceways, including abandoned conduits and raceways above accessible ceilings.
 - 2. Conduits and raceways concealed in existing construction to remain shall be abandoned in place. Cut conduits and raceways such that finished surfaces can be patched smooth.
- D. Wiring Devices: Remove abandoned wiring devices. Provide blank device plate for outlet box not being removed.
- E. Electrical Distribution Equipment: Disconnect and remove abandoned panelboards and electrical distribution equipment.
- F. Lighting Fixtures: Disconnect and remove abandoned lighting fixtures, including brackets stems, hangers and other accessories not indicated to be re-used.
- G. Existing Installations to Remain: Maintain access to existing electrical installations which remain active.
- H. Modify installation or provide access panel as required.
- I. Extension of existing circuits: Extend existing installations as required to maintain service to items to remain using materials and methods, as specified that are compatible with original installation.
- J. Adjacent Construction: Repair adjacent construction and finishes damaged during demolition and extension work.

- K. Dispose of hazardous materials, such as fluorescent and H.I.D. lamps and PCB's in lamp ballasts, in accordance with all Local, State and Federal ordinances and regulations.

3.4 SALVAGED MATERIALS

- A. Salvage existing materials for re-installation as directed by Owner. Coordinate locations for storage of salvaged materials with Owner.

3.5 CLEANING AND REPAIR

- A. Existing Materials: Clean and repair existing materials and equipment which remain or are to be re-used.
- B. Existing Panel boards: Clean exposed surfaces and check tightness of all electrical connections. Replace damaged circuit breakers with units of compatible construction and provide closure plates for vacant positions.
- C. Existing Lighting Fixtures: Where existing lighting fixtures are indicated to remain, clean reflector and lens and replace lamps.
 - 1. Use mild detergent to clean all interior and exterior surfaces; rinse with clean water and wipe dry; allow to dry thoroughly prior to re-installation.
 - 2. Replace lamps and broken electrical components. Replace cracked or broken lenses and louvers with new identical materials.
 - 3. Ballasts: Replace ballasts in all fluorescent lighting fixtures to remain or to be re-used with new ballasts as specified.

END OF SECTION

SECTION 26 0519

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Provide systems of wires and cables for electric power, signaling and control.
- B. Related work specified in other sections
 - 1. 26 00 00 - Electrical
 - 2. 26 05 20 - Cable Connections
 - 3. 26 05 23 - Control Voltage Electrical Power Cables
 - 4. 26 05 32 - Raceways
 - 5. 26 05 33 - Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

- A. ICEA 5-61-402 Thermoplastic Insulated Wire and Cable
- B. ICEA 5-66-524 Cross Linked Thermosetting Polyethylene Insulated Wires and Cables
- C. ICEA 5-68-516 Ethylene Propylene Rubber Insulated Wire and Cable
- D. ICEA 5-19-81 Rubber Insulated Wire and Cable
- E. ANSI 1581 Standard of Electrical Wires, Cables, and Flexible Cords.
- F. UL 83 Thermoplastic Insulated Wires and Cables
- G. UL 1569 Metal Clad Cables
- H. ASTM B3 Standard Specification for Soft or annealed Copper Wire
- I. ASTM B8 Standard Specification for Concentric Lay Standard Copper Conductors

1.5 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Provide closeout documents as required in Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver conductors and cable assemblies to the project in the manufacturer's standard reels or boxes marked with conductor material, insulation type, conductor size and U.L. Label.
- B. Store conductors and cable assemblies in a clean, dry location to prevent damage from moisture, dust, personnel and equipment.
- C. Handle conductors and cables in a manner to prevent damage to conductor, insulation, jackets, and identifying markings.

1.7 MANUFACTURERS

- A. The material shall be the product of a manufacturer with a minimum of ten years experience in the manufacture of similar material.
- B. Acceptable Manufacturers:
 - 1. AFC Cable Systems.
 - 2. Cerro Wire, Inc.
 - 3. Encore Wire
 - 4. General Cable
 - 5. Southwire Company
 - 6. Okonite Company

1.8 WARRANTY

- A. The material shall be warranted to be free from defect and in proper working order for one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 CONDUCTORS

- A. Copper Conductors
 - 1. Conductors shall be copper unless specifically noted otherwise on the Drawings.
 - 2. Copper conductors shall be soft drawn annealed copper, minimum conductivity 98% of pure copper per ASTM ASTM-B3.
 - 3. Sizes No. 10 AWG and smaller shall be solid conductor, single strand.
 - 4. Sizes No. 8 AWG and larger shall be concentric lay Class B stranding.
 - 5. Shall conform to the Conductor Properties proscribed in the NEC.
- B. Insulation
 - 1. Type THW: 600 volt moisture and heat resistant thermoplastic rated 75 Deg.C. in wet or dry locations.
 - 2. Type THW-2: 600 volt moisture and heat resistant thermoplastic rated 90 Deg.C. in wet or dry location.
 - 3. Type THWN: 600 volt moisture and heat resistant thermoplastic rated 75 Deg.C. in wet or dry.
 - 4. Type THWN-2: 600 volt moisture and heat resistant thermoplastic rated 90 Deg.C. in wet or dry locations.
 - 5. Type XHHW: 600 volt moisture resistant cross linked polyethylene rated 75 Deg.C. in wet or dry locations.
 - 6. Type XHHW-2: 600 volt moisture resistant cross linked polyethylene rated 90 Deg.C. in wet or dry locations.

- C. Cable Assemblies:
 - 1. Type MC Branch Circuit Cable: 600 volt, Type THHN/THWN conductors size 12 AWG through 10 AWG, including a green insulated grounding conductor, with steel interlocked armor applied over the assembly.
 - 2. Type MC Luminary Cable: 600 volt, Type THHN conductors size 12 AWG through 10 AWG, including a green insulated grounding conductor, 16 AWG Type TFN insulated lighting control conductors isolated from the power conductors, with steel interlocked armor applied over the assembly.

PART 3 EXECUTION

3.1 USES PERMITTED

- A. Wiring shall be Types THW-2, THWN-2 or XHHW-2 installed in metal raceways as specified in 26 05 32, Raceways.
- B. For final connections from junction boxes mounted on the building structure to recessed lighting fixtures. Type MC cable assemblies shall be permitted, with the cable assembly length not to exceed six feet and with supports as required by the NEC. Fixture-to-fixture chain wiring is not permitted.

3.2 COLOR CODING

- A. Where available, insulation shall be color coded by factory pigmentation for each phase and each voltage system employed on the project.
- B. 120/208 and 120/240 volt systems:
 - 1. Phase A - Black
 - 2. Phase B - Red
 - 3. Phase C - Blue
 - 4. Neutral - White
 - 5. Ground - Green
- C. 277/480 volt systems:
 - 1. Phase A - Brown
 - 2. Phase B - Orange
 - 3. Phase C - Yellow
 - 4. Neutral - Gray
 - 5. Ground - Green
- D. Switch legs, travelers and special systems shall be continuous color scheme throughout the project as selected by the Contractor.
- E. Where factory pigmentation is not available, code conductors with 1-1/2" colored tape band at each terminal and at each pull or junction box.

3.3 GROUNDING CONDUCTORS

- A. All branch circuits and feeders shall include an insulated equipment grounding conductor. Raceway systems shall not be used as the sole equipment grounding path without specific approval.

3.4 MULTIWIRE BRANCH CIRCUITS

- A. Multiwire branch circuits shall not be permitted unless required by the device served, such as for connection to modular furniture systems or track lighting systems.

- B. Where multiwire branch circuits are required, branch circuit breakers shall be two or three pole with common trip and one handle.

3.5 MINIMUM SIZE

- A. Conductors shall be of the minimum size shown on the drawings, lighting and power branch circuit wiring shall be minimum No.12 AWG.
- B. Feeder circuit wiring shall be sized to limit the effect of voltage drop, based on the actual installed conductor length to limit voltage drop to 2% of nominal system voltage.
- C. Branch circuit wiring shall be size to limit the effect of voltage drop, based on the actual installed conductor length, to limit voltage drop to 3% or less of nominal system voltage.
- D. Circuits shall be grouped in raceways and grouped together when passing through enclosures to have phases and neutral grouped together to minimize circuit reactance.

3.6 INSTALLATION

- A. Examine the system in which the conductors are to be installed for defects in equipment and installation which may cause damage to the conductors, insulation, or jackets.
- B. Pull a swab or mandrel through conduit systems immediately before pulling conductors to insure a full bore, clean raceway system.
- C. Do not exceed the conductor manufacturer's maximum pulling force or minimum bending radius.
- D. Use pulling lubricant compound where necessary and recommended by the manufacturer.
- E. Conductors or cables which have insulation or jackets damaged in the pulling process shall be removed and replace with new material.

3.7 FIELD QUALITY CONTROL

- A. Test all wiring insulation with a megohm meter prior to energization:
 - 1. Phase to ground
 - 2. Phase to phase
 - 3. Phase to neutral
 - 4. Neutral to ground
- B. Perform test in accordance with manufacturer's recommendation and to meet manufacturer's published minimum insulation values.
- C. Correct all defects revealed by such tests including replacing material with new as required.

END OF SECTION

SECTION 26 0520

CABLE CONNECTIONS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1- General Requirements and related documents.
- B. All sections of this Specification.

1.2 DESCRIPTION

- A. Work Included: Provide wire connections and devices to be readily identifiable, mechanically and electrically secure wiring system.
- B. Related work specified in other sections:
 - 1. 26 05 19 - Low Voltage Electrical Power Conductors and Cables

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Provide closeout documents as required in Division 1.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Connections shall be made in atmospheres that are free from dirt, moisture, and elements which may be damaging.

1.6 MANUFACTURERS

- A. The materials shall be the product of a manufacturer with a minimum ten years experience in the manufacture of similar materials.
- B. Acceptable manufacturers are listed with the products.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Spring Connectors: Ideal "Wingnut" 3M-Scotch, Buchanan, and Thomas and Betts.
- B. Terminal Connectors: O-Z/Gedney, Burndy, and Thomas and Betts.
- C. Splice Connectors: O-Z/Gedney or Burndy with insulating cover.
- D. "T" and Parallel Connectors: O-Z/Gedney or Burndy with insulating cover.
- E. Vinyl Plastic Tape: 3M-Scotch #33 or #88, Plymouth and Okonite.
- F. Rubber Tape: Okonite, 3M-Scotch and Plymouth.
- G. Colored Tape: 3M-Scotch, Plymouth.

- H. Wire Ties: Thomas and Betts "Ty-Rap", Ideal and Panduit.
- I. Tie Mounts, Plates, Anchors: Thomas and Betts, Ideal, and Panduit.
- J. Wire Tags: Self-laminating, cloth, wrap-on type by Thomas and Betts, Ideal, and Brady.
- K. Terminal Strips: Nylon; 600 volt; modular plug-on construction; tubular compression slip-in terminals properly sized; complete with mounting track, end clips, and anchors by Allen-Bradley, Square D, and Buchanan.
- L. Cable and Cord Fittings: Crouse-Hinds with wire mesh grip or Appleton.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine wires to be joined, tapped, spliced, terminated, and their connecting devices for defects which may affect the mechanical and electrical integrity of the connection.
- B. Do not proceed until defects are corrected.

3.2 PREPARATION

- A. Remove proper amount of insulation necessary for connection, clean conductors.

3.3 INSTALLATION

- A. No. 10 Wire and Smaller: Connect with spring connectors, terminate at terminal strips.
- B. No. 8 Wire and Larger: Connect and terminate with above specified tape half-lapped to produce a dielectric value equal to wire insulation.
- C. Train, hold, clamp, and tag wiring in cabinets, pull boxes, panels, and junction boxes with above specified devices.
- D. Splices in feeders and mains may only be made where designated on the drawings and where prior approval is obtained from the Architect.
- E. Install terminal strips in enclosures without means for termination of wiring.
- F. Install cable and cord grips on all cables and cords, entering enclosures. Use wire mesh grips where necessary for strain relief.

3.4 FIELD QUALITY CONTROL

- A. Test: Connections shall be resistance tested with megohm meter as specified for wire.

3.5 ADJUSTMENTS

- A. Assure that wire connections made by others in equipment furnished by others are mechanically and electrically sound prior to energization.

END OF SECTION

SECTION 26 0523

CONTROL - VOLTAGE ELECTRICAL POWER CABLES

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide power wiring, raceways, and connections for items of equipment and control systems.
- B. All wiring for every system shall be installed in metal conduit. Refer to Section 26 05 32 Raceways for conduit types and materials for specific locations and applications.
- C. Related work specified in other sections:
 - 1. 23 09 00 - Instrumentation and Controls for HVAC
 - 2. 26 00 00 - Electrical
 - 3. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 4. 26 05 32 - Raceways
 - 5. 26 51 05 - Networked Lighting Controls
 - 6. 28 31 00 - Fire Alarm System

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 WARRANTY

- A. The material shall be warranted to be free from defect and in proper working order for one year following the date of final acceptance.

1.5 COORDINATION

- A. For equipment furnished under other Divisions, obtain equipment supply and wiring requirements from the Contractor supplying the equipment.
- B. For equipment furnished under Division 23, obtain complete temperature control system drawings, and power supply and interlock wiring requirements from the Contractor furnishing the systems.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Refer to related work specified in other sections for material requirements.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Work Included: The Electrical Contractor shall provide:

1. Branch circuit and motor feeder circuit conductors, raceway, connections, and overcurrent protection for each motor or item of equipment furnished by the Owner or other Contractors.
2. Motor Control Centers, where indicated on the drawings.
3. Installation of motor controllers furnished by the Owner or other Contractors, along with branch circuit and motor feeder circuit conductors, raceway, and connections in accordance with the manufacturer's approved wiring diagrams.
4. Disconnect switches and combination disconnect switches and motor controllers, where indicated on the drawings or required by codes, except as provided as an integral part of manufactured equipment.
5. Power supply conductors, raceway, connections, and overcurrent protection for input power to HVAC Temperature Controls, HVAC Automation, and HVAC Energy Management Systems in accordance with approved rough-in and connection diagrams furnished by the system suppliers.
6. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to ensure that all work is contained within the General Contract. Nothing herein shall be construed to confine the General Contractor from assigning the work to any member or group of contractors deemed best suited to executing the work to affect the contract. Refer to specific bidding instructions of the General Contractor for the actual division of the work. The General Contractor is fully responsible for the installation of complete, operating systems in accordance with the functional intent of the specifications.

B. Work Not Included: The Mechanical Contractor shall provide:

1. Motors and equipment, erected in place and ready for final connection of power supply wiring, along with manufacturer's approved wiring diagrams.
2. Motor controllers, in suitable enclosures and of the type and size in accordance with the manufacturer's recommendations and NEMA requirements, along with properly sized overload elements and approved wiring diagrams.
3. Disconnecting switches or devices which are normally provided as a part of manufactured equipment.
4. Rough-in and connection diagrams for input power supply and connections for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems.
5. Conductors, raceways, devices, and connections for low voltage control, line voltage control, and signaling systems for the HVAC Temperature Control, HVAC Automation, and HVAC Energy Management Systems in accordance with the provisions of Division 26, and approved systems shop drawings to provide complete operating systems in accordance with the functional requirements of the specifications.
6. The above represents an outline of the work for the purpose of describing one division of the work which is acceptable to ensure that all work is contained within the General Contract. Nothing herein shall be construed to confine the General Contractor from assigning the work to any member or group of contractors deemed best suited to executing the work to affect the contract. Refer the specific bidding instructions of the General Contractor for the actual division of work. The General Contractor is fully responsible for the installation

of complete, operating systems in accordance with the functional intent of the specifications.

- C. Completely connect all electrical consuming items of mechanical equipment, kitchen equipment, shop equipment, etc., provided by the Owner or other trades. Outlets of various types have been indicated at equipment locations, but no indications or exact location or scope of work is indicated on the accompanying drawings.
- D. Refer to details and information furnished by the Owner and various equipment suppliers for equipment wiring requirements and to the Plumbing and Heating, Ventilating and Air Conditioning Specifications for the scope of the connections to equipment provided under those sections, and determine from the various trades by actual measurements at the site, and by direction from the Owner and the Architect the exact locations of all items. Roughing-in drawings, wiring diagrams, etc., required for the proper installation of the electrical work will be furnished by applicable trades furnishing equipment. Request the drawings and information required in writing to the equipment supplier in ample time to permit preparation of the drawings and to permit proper installation of all wiring. Obtain from those furnishing equipment the size and type of service required for each motor or piece of electrical equipment and verify that the service to be installed is compatible.

3.2 INSTALLATION

- A. All conduits shall terminate in conduit boxes on motors where possible. When motors are direct connected, the conduit may continue rigid into the box, but when motors drive through belts and have sliding bases, a piece of flexible liquid tight conduit not less than 12 inches long shall be connected between the rigid conduit and the motor terminal. Where motors are not provided with conduit boxes, terminate the conduit in a conduit at the motor.
- B. Where disconnecting switches are not provided integral with the control equipment for motors, provide and install a disconnect switch in the circuit to each motor where indicated and required by code. Switches shall be installed as close as possible to the motor or controls they serve and they shall be within sight of the motor or control circuit.
- C. Be responsible for installing all conductors and protective devices serving equipment motors furnished by others in strict conformance with all applicable codes, regardless of any discrepancy in plans and/or mechanical equipment sizes variations, unless covered by directives issued by the Architect.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Provide a grounding electrode for the facility and a ground electrode conductor system to connect to the electric service main equipment.
- B. Provide supplementary grounding electrodes as specified herein.
 - 1. Provide connections from the grounding electrode system to:
 - 2. The electric power system grounded circuit conductor (neutral).
 - 3. The electric power system non-current carrying enclosures and equipment ground conductors (equipment ground).
- C. Provide connections from the grounding electrode system to auxiliary ground conductors for data and voice communication systems (isolated ground).

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

- A. National Electrical Code, NFPA 70.
- B. EIA/TIA Standard 607
- C. IEEE - Standard 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- D. IEEE Standard 81 - Guide for Measuring Earth Resistivity.

1.5 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Provide closeout documents as required in Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver conductors and cable assemblies to the project in the manufacturer's standard reels or boxes marked with conductor material, insulation type, conductor size and U.L. Label.
- B. Store conductors and cable assemblies in a clean, dry location to prevent damage from moisture, dust, personnel and equipment.

- C. Handle conductors and cables in a manner to prevent damage to conductor, insulation, jackets, and identifying markings.

1.7 MANUFACTURERS

- A. The materials shall be the products of a manufacturer with a minimum of ten years experience in the manufacture of similar material.
- B. Acceptable manufacturers shall be as listed with the material descriptions.

1.8 WARRANTY

- A. The material shall be warranted to be free from defect and in proper working order for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 GROUND RODS

- A. Standard ground rods shall be 3/4 inch diameter, 10 foot length, copper clad steel, equal to Thompson Company.

2.2 CONDUCTORS

- A. Conductors buried in contact with the earth shall be bare copper, solid for sizes up to No. 6 AWG, concentric lay strand for sizes No. 8 AWG and larger.
- B. Conductors for installation below raised access floor systems shall be bare copper, solid for sizes up to No. 6 AWG, concentric lay strand for sizes No. 8 AWG and larger.
- C. All other grounding conductors shall be copper conductor, Type THWN 600 volt 90 Deg.C. thermoplastic insulation, green color where available.

2.3 CONNECTIONS

- A. All connections made below grade, in inaccessible locations, and all connections and splices in the grounding electrode conductor system shall be made by exothermic weld process equal to Cadweld. Provide polyethylene inspection well covers and lids equal to Erico #T416B.
- B. All other connections shall be hydraulically crimped irreversible connectors equal to Thomas and Betts 54000 Series.
- C. Connections to raised access floor system pedestals shall be Thomas and Betts 38268 malleable iron mechanical clamp.
- D. Connections to cable trays shall be Thomas and Betts 10105 malleable iron mechanical clamp.
- E. Connections to domestic cold-water piping shall be Thomas and Betts GUV Series copper alloy U-bolt and mechanical clamp.
- F. Connections to building structural steel shall be exothermic weld equal to Cadweld.
- G. Connections which require flexibility for movement, expansion, or vibration shall be made with flexible flat conductor, multiple strands of 30 gauge copper conductors or equivalent circular mil area to the primary ground conductor. Protect ends with copper bolt hole end pieces.

2.4 CONDUITS

- A. Provide malleable iron conduit grounding bushings where:

1. Metallic raceways terminate at metal housings without mechanical and electrical connection to housing.
2. At each end of metallic conductors for grounding conductors where conduits are electrically non-continuous.
3. At the ends of service entrance conduit.

PART 3 EXECUTION

3.1 GROUNDING ELECTRODE

- A. Provide one, or more, driven solid ground rods to serve as the grounding electrode for the facility. Additional rods shall be driven at not less than ten-foot separation and connected together until the specified resistance testing criteria can be met.
- B. Grounding electrode shall be tested and certified to provide five ohms or less Earth resistivity.

3.2 SUPPLEMENTARY GROUND ELECTRODES

- A. The following items, where they exist on the project, shall be bonded together with the main grounding electrode described above:
 1. Domestic cold water service entrance.
 2. Building structural steel frame.
 3. Minimum twenty feet of bare copper conductor, minimum No. 4 AWG, encased in a concrete footing along the exterior perimeter edge of the building.
 4. Lightning Protection System.
- B. Ground Electrode Bus:
 1. Provide a single copper bus bar located adjacent to the service main disconnecting means as the common connection point for the main ground electrode and each supplementary ground electrode.
 2. Mount ground bus on suitable wall insulator stand-offs.
 3. All grounding electrode conductors shall be permanently connected to this bus with exothermic weld connections.
 4. All grounding electrode conductors shall be the same size and shall be not less than the size required by NEC or the size shown on the Drawings.
 5. Connect the grounding electrode system to the main ground connection in the U.L. Listed Service Disconnecting means in the main switch or switchboard.

3.3 GROUNDED CIRCUIT CONDUCTOR

- A. Bond the grounding electrode system to the grounded circuit conductor (neutral conductor) at one location only, on the supply side of the service disconnecting means, with a neutral disconnecting link as required by the NEC.

3.4 EQUIPMENT GROUNDING CONDUCTORS

- A. Bond the non-current carrying parts of the electric power system to the grounding electrode conductor at the service disconnecting means. From this point forward, all non-current carrying parts of the electric power system shall be electrically connected and continuous by means of:
 1. Electrically continuous equipment enclosures, metallic boxes and metallic raceways connected with U.L. Listed connectors and couplings.
 2. Equipment grounding conductors supplementary to metallic raceway systems where shown on the Drawings.

3. Equipment grounding conductors in non-metallic raceway systems and in flexible metal conduit systems.
4. Where permitted under other sections of the Specification, the insulated grounding conductor provided in Type MC cable will be considered an acceptable equipment grounding conductor.
5. Uninsulated grounding strips and spiral wrap provided in Type AC cable is not an acceptable grounding conductor.

3.5 SEPARATELY DERIVED SYSTEMS

- A. Separately derived systems include:
 1. Secondaries of dry type power transformer.
 2. Outputs of uninterruptible power systems.
 3. Outputs of motor generator sets or frequency convertors.
- B. These systems shall be grounded in accordance with the NEC, similar to the service disconnecting means discussed above, and as shown on the Drawings.
- C. The grounding electrode conductor from a separately derived system shall be connected to the main ground electrode bus described above, or to one of the secondary ground electrode busses, if present.
- D. A second grounding electrode conductor shall connect to building structural steel frame at the nearest available location, if available.

3.6 TESTING

- A. Grounding Electrode:
 1. The earth resistance of the main ground electrode shall be not more than 5 ohms.
 2. Perform a measurement of ground resistance by one of the means described in IEEE Standard 81, Guide for Measuring Earth Resistivity.
 3. Provide written certification of the ground resistance measurements upon request.
- B. Grounding Continuity:
 1. Provide continuity tests and checks of equipment grounding and isolated grounding conductor systems to ensure electrical continuity.
 2. Provide written certification of continuity checks upon requests.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1- General Requirements and related documents.
- B. All sections of this Specification.

1.2 DESCRIPTION

- A. Work Included: Provide miscellaneous materials for the supporting of electrical material and equipment.
- B. Related work specified in other sections:
 - 1. 26 00 00 - Electrical
 - 2. 26 05 32 - Raceways
 - 3. 26 05 33 - Boxes for Electrical Systems
 - 4. 26 27 16 - Electrical Cabinets and Enclosures

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Provide closeout documents as required in Division 1.

1.5 MANUFACTURERS

- A. Listed with Materials.
- B. Acceptable Manufacturers
 - 1. Unistrut
 - 2. Caddy
 - 3. Thomas & Betts

PART 2 PRODUCTS

2.1 MATERIALS

- A. Continuous Slotted Channel: #12-gauge steel, electrogalvanized, with zinc chromate, bases and dimensions as required for application.
- B. Hanger Rods: Continuous thread, electrogalvanized, with zinc chromate, sizes as required for loads imposed.
- C. Hex Head Cap Screws and Nuts: No. H-113 and No. H-114, respectively.
- D. One-Hole Pipe Straps: Series HS-100, galvanized steel

- E. Single Bolt Channel Pipe Straps: Steel, with machine screws and nut, Series C-105 and Series C-106.
- F. Lay-In Pipe Hanger: Series C-149.
- G. Conduit and Pipe Hanger: Series 6H.
- H. Beam Clamps: Series 500, RC, EC, and PC for applications.
- I. Concrete Inserts, Spot: Series D-256 or No. D-255.
- J. Concrete Inserts, Channel: Series D-980 or Series D-986.
- K. Riser Clamps: Series C-210.
- L. Cable Supports: O-Z/Gedney Type S.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Carefully lay out and provide concrete inserts.
- B. Securely fasten and support conduits and raceways to the building structure.
- C. Suspend horizontal runs of conduit and raceways from the floor and roof construction by rod hangers spaced 10 feet on less on centers for sizes 2-1/2 inches and greater and 9 feet or less on centers for sizes 2 inch and smaller.
- D. Fasten single runs of conduit to the structure with one-hole pipe straps and beam clamps or hang on rod hangers.
- E. Support multiple runs of conduit and raceways from continuous channel inserts or from trapeze hangers constructed of rod hangers and channels.
- F. Fasten single conduits to rod hangers with adjustable lay-in pipe hangers or for 2 inches and smaller conduits with Series 6H pipe hangers.
- G. Fasten conduits to channels with pipe channel straps.
- H. Support conduits and raceways within 3 feet of each end of each bend, of each termination, and at other intervals to maintain horizontal and vertical alignment without sag and deformation.
- I. Do not use cable, strap, and wire hangers as fasteners.
- J. Provide riser clamps for conduits at floor lines. Provide wire and cable supports in pull boxes for risers in accordance with NEC Section 300-19 and Table 300-19 (a).
- K. Install supports to permit equally distributed expansion and contraction of conduits and raceways with expansion joints. Use guides or saddles and U-bolts and anchors designed for equal effectiveness for both longitudinal and transverse thrusts.
- L. Do not support conduits and raceways for equipment connections.
- M. Provide special supports with vibration dampers to minimize transmission of vibrations and noises.
- N. Provide trapeze hangers for conduits and raceways where routing interferes with ducts.
- O. Provide hangers, racks, cable cleats and supports for wires and cables in cable chambers and other locations to make a neat and substantial installation.
- P. Provide angle iron and channel supports to the floor and structure for panelboards, cabinets, pull and junction boxes. Support independently from entering conduits and

raceways. Provide supports as specified for conduits and raceways for outlet boxes and pull boxes 100 cubic inches and smaller.

Q. Provide supports sized for the ultimate loads to be imposed.

3.2 CLEANING

A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 0532

RACEWAYS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide a mechanically and electrically complete conduit system.
- B. Related work specified in other sections:
 - 1. 26 00 00 - Electrical
 - 2. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 3. 26 05 29 - Hangers and Supports for Electrical Systems
 - 4. 26 05 23 - Control Voltage Electrical Power Cables

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Certificates:
 - 1. Labels of Underwriters' Laboratories, Inc. affixed to each item of material.
 - 2. If materials are by manufacturers other than those specified submit certification that material meets applicable Underwriters' Laboratories, Inc. Standards.
 - 3. Labels of ETL Verified PVC-001 affixed to each PVC Coated Galvanized Rigid Conduit.
- D. Provide closeout documents as required in Division 1.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect conduits and finishes from damage.

1.6 MANUFACTURER

- A. The materials shall be the products of a manufacturer with a minimum of ten years experience in the manufacture of similar equipment.
- B. Acceptable Manufacturers
 - 1. Metallic Conduits: Allied, and Wheatland.
 - 2. Nonmetallic Conduits: Cantex, and SEDCO.

1.7 WARRANTY

- A. The materials shall be warranted to be in proper working condition for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Rigid Metal Electrical Conduit: Hot-dipped galvanized steel with zinc coated threads and an outer coating of zinc bichromate, complete with one coupling and one end thread protector. Intermediate metal conduit (IMC) is not allowed.
- B. Electrical Metallic Tubing: Welded, electro-galvanized thin wall steel tubing.
 - 1. Conduit for power wiring shall be natural electro galvanized.
 - 2. Conduit for other systems shall be color coded in accordance with Section 26 05 23 - Control Voltage Electrical Power Cables.
- C. Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with integral copper ground wire on sizes 1-1/4" and smaller.
- D. Liquidtight Flexible Metal Electrical Conduit: Hot-dipped galvanized steel strip core with extruded polyvinyl jacket.
- E. Rigid Nonmetallic Electrical Conduit: Schedule 40 heavy wall polyvinylchloride, high impact resistant.
- F. Elbows and Bends:
 - 1. All Types: Size 1-1/4 inch and larger shall be factory manufactured.
- G. Bushings:
 - 1. 1-1/4" and Smaller: Same material as the conduit with which they are installed.
 - 2. 1-1/2" and Larger: Hot-dipped galvanized with thermosetting phenolic insulation, 150 Deg.C.
- H. Locknuts:
 - 1. 1-1/2" and Smaller: Zinc plated heavy stuck steel, O-Z/Gedney.
 - 2. 2" and Larger: Cadmium plated malleable iron, O-Z/Gedney.
- I. Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney.
- J. E.M.T. Compression Connectors: Gland compression type, zinc plated steel body, cadmium plated, malleable iron nut, insulated throat, O-Z/Gedney.
- K. E.M.T. Compression Couplings: Gland compression type, zinc plated steel body, cadmium plated malleable iron nut, O-Z/Gedney.
- L. Liquidtight Conduit Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integrally cast external ground lug, O-Z/Gedney.
- M. Seals for Watertight Wall and Floor Penetrations: Malleable iron body, oversize sleeve, sealing ring, pressure clamp and rings and sealing grommet, hex head cap screws, O-Z/Gedney.
- N. Seals for Penetrations through Existing Walls: Thunderline Corporation Link-Seal watertight sleeves, complete with wall and casing seals.
- O. Fire Seals: Galvanized iron pipe sleeves sealed with approved foam type fireproofing.

- P. Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers selected for linear or linear with deflection, as required.
- Q. Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10.
- R. Accessories: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron on the forms and dimensions best suited for the application.
- S. Identifying Tape for Underground Conduits: Polyethylene tape, 6 inches wide, with continuous printing along length, Brady Identoline:
 - 1. For Electric Power Conduits: Yellow with black letters.
 - 2. For Other Services: Green with black letters.
- T. Sleeves: 22 gauge galvanized steel sleeves where conduits pass through walls and floors. Standard galvanized steel pipe where conduits pass through beams, outside walls, or structural members.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine surfaces to which conduits are to be secured for:
 - 1. Defects which will adversely affect the execution and quality of work.
 - 2. Deviations from allowable tolerances for the building material.
- B. Do not start work until defects and deviations are corrected.

3.2 INSTALLATION

- A. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be drawn into conduit. Do not use conduit sized less than 3/4" unless specified otherwise.
- B. Conceal conduits from view in all areas except mechanical and electrical equipment rooms and crawl spaces. Should it appear necessary to expose any conduit:
 - 1. Bring to the attention of the Architect, immediately, and
 - 2. Rearrange the work to facilitate an approved installation.
- C. Install all conduits at elevations and locations to avoid interference with grading of other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry units.
- D. To prevent displacement, securely support and hold in place all conduits installed in advance of other work and to be concealed in the building structure.
- E. Carefully lay out conduits run within the structure, such as floors, beams, walls, to avoid densities excessive for the construction. Relocate those conduits when excessive densities occur.
- F. Ream, remove burrs, and swab inside conduits before conductors are pulled in.
- G. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.
- H. Bends and offsets in 1" and smaller conduits may be done with approved bending devices. Do not install conduits which have had their walls crushed and deformed and their surface finish damaged due to bending.
- I. Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best required for the application.

- J. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.
- K. Install insulated throat threaded hubs on conduits entering enclosures without threaded hubs where exposed to damp or wet locations.
- L. Connect and couple E.M.T. with compression type fittings. Do not use indentor and set screw fittings.
- M. Install and neatly rack exposed conduits parallel with and perpendicular to the building walls. Do not install exposed diagonal conduit runs.
- N. Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices in accordance with the National Electrical Code.
- O. Do not run conduits exposed on the roof unless approval is obtained prior to installation.
- P. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".
- Q. Connect motors, equipment containing motors, equipment mounted on an isolated foundation, and other equipment and devices which are subject to vibration and which require adjustment with flexible metallic conduit from the device to the conduit serving it. Size the flexible conduit length more than 12 diameters, but less than 18 diameters. Rigidly support the points of attachment on each side of the connection.
- R. Install escutcheons on all exposed conduits passing through interior floors, walls, or ceilings. Install fire sealing materials on all conduits passing through fire rated partitions. Install wall and floor fire seals on all conduits passing through exterior walls and floors.
- S. Conduit sleeves shall be sized to permit insertion of conduit with adequate clearance for movement due to expansion and contraction. Where conduits pass through outside walls, watertight fittings, as specified herein, shall be used.
- T. Provide pullstring in each empty conduit. Label pullstring when conduit termination is not obvious.
- U. All stubups of PVC conduit runs shall be made with rigid galvanized steel conduit with protective wrapping. Provide corrosion resistant protective wrapping from where the galvanized conduit begins to 4" above the finished floor.

3.3 USES PERMITTED

- A. Rigid Metal Conduit:
 - 1. Exterior conditions above grade.
- B. Schedule 40 PVC with concrete encasement:
 - 1. Below grade exterior to the building.
 - a. Electric Services.
- C. Schedule 40 PVC without concrete encasement:
 - 1. Below grade interior to the building.
- D. Electrical Metallic Tubing:
 - 1. All uses above grade interior to the building, except as limited elsewhere in this section.

- E. Steel Armor Clad Cable:
 - 1. Final connection from junction boxes on structure to individual light fixtures. Fixture-to-fixture wiring not permitted.
- F. Flexible Metal Conduit:
 - 1. Final connection to vibrating or adjustable equipment.
 - 2. Connection to vibrating equipment shall contain one 90 degree bend.
- G. Liquid tight Flexible Metal Conduit:
 - 1. All uses permitted for flexible metal conduit.
 - a. In damp or wet locations.
 - b. Exterior to the building.

END OF SECTION

SECTION 26 0533

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCE DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all of the Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide outlet boxes for the installation of wiring devices, lighting fixtures, and power and control connections.
- B. Related work specified in other section:
 - 1. 26 00 00 - Electrical
 - 2. 26 27 26 - Wiring Devices
 - 3. 26 51 01 - Interior Lighting
 - 4. 26 05 23 - Control-Voltage Electrical Power Cables

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Provide closeout documents as required in Division 1.

1.5 MANUFACTURERS

- A. Listed with Materials.
 - 1. Appleton Electric Company
 - 2. Raco
 - 3. Steel City
 - 4. Crouse Hinds
 - 5. Hubbell
 - 6. Raceway Components
 - 7. Walker

PART 2 PRODUCTS

2.1 MATERIALS

- A. Flush Mounted Outlet Boxes: Standard, stamped galvanized steel with factory conduit knockouts, one piece and welded construction:
 - 1. Series 4S and 4S0 square boxes with covers.

2. Series M1, M2, M3 - 250 and Series M1, M2, M3 - 350 masonry boxes with covers.
 3. Series 2G and GC-5075 switch boxes with covers.
 4. Series OCR concrete rings with Series OCP and OCP-3/8 back plates.
 5. Series 40 and 40D octagonal boxes with raised covers.
 6. Series SX expandable bar hangers.
- B. Surface Mounted Outlet Boxes: Cast metal with threaded hubs. Type FS and FD with covers of form suited to the application.
 - C. Fire Rated, Flush, Poke-Thru Outlets: Raceway Components, Inc. #RC-700A.
 - D. Fire Rated, Flush, Poke-Thru Outlets with Conduit Adapter: Raceway Components, Inc. #RC-700-6-A.
 - E. Floor Outlet Boxes: Hubbell cast flush floor boxes, fully adjustable with flush service fitting, and carpet flange (if required).

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine building structure to which outlet boxes are to be secured for defects which affect the execution and quality of work.
- B. Do not start work until defects are corrected.

3.2 PREPARATION

- A. Carefully measure and lay out exact locations in conference with the Construction Manager.
- B. Owner may change outlet box locations a distance of 5 feet before rough-in without additional cost.

3.3 INSTALLATION

- A. Provide the appropriate cover plate for all boxes in all applications. No unused boxes shall be provided without a cover plate.
- B. In dry walls for single and two gang outlets provide 4S and 4D boxes; for 3 or more outlets use masonry boxes.
- C. In poured concrete floors, provide cast flush floor boxes complete with service fittings and carpet flanges (if required).
- D. In block and masonry walls provide masonry boxes of depths required for wall thickness.
- E. In poured concrete and plastered walls provide 4S and 4D boxes for single gauge outlets and 2G and 3G-5075 boxes for multiple ganged outlets.
- F. In other ceilings provide 40 and 40D boxes. Omit covers if standard canopy and device plates entirely cover the ceiling opening.
- G. In exposed work, exterior of the building, in wet locations, and flush in non-waterproofed walls below grade provide FS and FD boxes.
- H. Submit for approval special boxes for special devices and applications. Size according to device and application in accordance with NEC.
- I. Install outlet boxes finished to within 1/8 inch of finished surfaces.
- J. Install center of box at heights above finished floor:

1. Wall Switches: 45 Inches
 2. Convenience Outlets: 18 Inches
 3. Telephone/Data Outlets: 18 Inches
 4. Wall Telephone Outlets: 45 Inches
 5. Boxes Indicated Above Counters: 4 Inches above backsplash and trim, unless otherwise indicated.
- K. Install wall switch outlet boxes on the strike side of doors as finally hung.
- L. Group outlet on circuits with homeruns as indicated on the Drawings.
- M. Do not provide through-the-wall and back-to-back boxes unless specifically noted on the drawings.
- N. Provide standard manufactured plugs in unused openings of boxes.
- O. Provide boxes at the terminal of conduit runs to outlets and devices.
- P. Provide plaster rings and covers where required by the building structure.
- Q. In brick finished walls, locate to work brick in a brick course where possible, and to permit conduits and raceways to enter from the rear without cutting brick, where possible.
- R. Provide 3/8-inch studs and lighting fixture outlet boxes where shop drawings of fixtures require and elsewhere as may be required for fixtures.
- S. Rigidly attach to structure and ceiling supporting members in suspended ceilings to avoid cutting mechanical ceiling members.
- T. Label all junction boxes with circuit information as to its use for special system equipment.
- 3.4 CLEANING
- A. Clean surfaces to be painted.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCE DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all of the Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Provide identification of electrical equipment.
- B. Provide identification of over current devices.
- C. Provide identification of branch circuits, outlets, and wiring devices.
- D. Provide identification of required clear working spaces for electrical equipment.
- E. Provide identification of rooms and spaces for access by qualified personnel.
- F. Related work specified in other section:
 - 1. 26 05 33 - Boxes for Electrical Systems.
 - 2. 26 22 13 - Low Voltage Distribution Transformers.
 - 3. 26 24 16 - Panelboards.

1.3 QUALITY ASSURANCE

- A. Signs and placards shall meet the requirements by OSHA.

1.4 SUBMITTALS

- A. Submit literature describing all labels, signage and marking materials to the Architect for approval prior to installation.
- B. Samples: Provide samples upon specific request.
- C. Submit product data under provisions of section 26 00 00 Electrical.
- D. Provide closeout documents as required in Division 1.

PART 2 PRODUCTS

2.1 PLACARDS

- A. Placards shall be engraved phenolic name plates with engraved lettering engraved. Lettering shall be minimum 24-point type in basic block font.
- B. Placards shall be securely and permanently adhered to the equipment enclosures without fasteners or penetrations into the enclosures.
- C. Placards shall be color coded for various systems as follows:
 - 1. Utility Power Systems: White placard, black lettering.

2.2 LABELS

- A. Labels shall be typewritten, adhesive backed printed labels. Lettering shall be minimum 18-point type in basic black font.

2.3 MARKING MATERIALS

- A. Materials for marking of required working clearance shall be adhesive backed yellow tape, equal to 3M Company 471 Series. Clean and prepare floor surface in accordance with manufacturer's instructions.

2.4 SIGNAGE

- A. Signage for electrical equipment rooms shall be preprinted manufactured sign units providing warning of the Danger of Electrical Equipment Hazards and limiting access to Qualified Personnel only.
- B. Signage shall be securely and permanently adhered to the door surface without fasteners or penetrations into the door surface.
- C. All signage shall be approved by the Architect prior to installation.

PART 3 EXECUTION

3.1 DISTRIBUTION PANELBOARDS

- A. Provide each switchboard and panelboard with a placard identifying.
 - 1. The name of the equipment.
 - 2. The supply system voltage.
 - 3. The name of the equipment supplying the switchboard or panelboard.
 - 4. The circuit number of the overcurrent device supplying the switchboard or panelboard.
- B. Provide each feeder protective device with a placard identifying the name of the device or circuit number and the name of the equipment or load served.

3.2 LIGHTING AND APPLIANCE PANELBOARDS

- A. Provide each panelboard with a placard identifying:
 - 1. The name of the equipment.
 - 2. The supply system voltage.
 - 3. The name of the equipment supplying the switchboard or panelboard.
 - 4. The circuit number of the overcurrent device supplying the panelboard.
- B. Provide each panelboard with a typewritten circuit directing card describing the name of the load served and the room number (3) where the devices are located. Reference the room number(s) actually installed at the project, not the room numbers for Architectural construction documents.

3.3 LOW VOLTAGE DISTRIBUTION TRANSFORMERS

- A. Provide each transformer with a placard identifying:
 - 1. The name of the equipment.
 - 2. The name of the supply source equipment and protective device circuit number.
 - 3. The supply system voltage.
 - 4. The load systems voltage.
 - 5. The name of the equipment supplied from the load side of the transformer.

3.4 DISCONNECT SWITCHES

- A. Provide other electrical and mechanical equipment with placards identifying.
 - 1. The name of the equipment.
 - 2. The name of the supply source equipment.
 - 3. The circuit number of the overcurrent device supplying the equipment.

3.5 OTHER EQUIPMENT

- A. Provide other electrical and mechanical equipment with placards identifying.
 - 1. The name of the equipment.
 - 2. The name of the supply source equipment.
 - 3. The circuit number of the overcurrent device supplying the equipment.

3.6 OUTLET BOXES, JUNCTION BOXES AND WIRING DEVICES

- A. Provide labels affixed to the outside cover for each outlet box, junction box, and wiring device identifying the panel name and branch circuit numbers for the overcurrent devices supply the circuits.

3.7 REQUIRED WORKING CLEARANCES

- A. Provide marking on the floor around each item of equipment defining the required working clearances in accordance with the National Electrical Code.

3.8 ELECTRICAL EQUIPMENT ROOMS

- A. Provide each entry door into a room or space containing electrical power distribution equipment providing Warning of the Electrical Hazard and restricting entrance to Qualified Personnel only.

END OF SECTION

SECTION 26 0573

ELECTRIC POWER SYSTEM ANALYSIS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.

1.2 DESCRIPTION

- A. Provide a computer-based fault current study utilizing industry accepted standards, practices, and analysis tools.
 - 1. Equipment with interrupting or withstand ratings of less than the available fault current shall be identified.
 - 2. Equipment which requires series ratings of components in order to provide adequate interrupting ratings shall be identified.
- B. Provide a computer-based overcurrent protective device coordination study utilizing industry accepted standards, practices, and analysis tools.
 - 1. Components which cannot achieve full coordination shall be identified.
 - 2. Adjustable protective devices shall be set based on the results of the study.
 - 3. Replaceable protective devices including fuses shall be verified to be the value, rating and speed required based on the results of the study.
- C. Provide a computer-based arc flash hazard analysis of the electrical distribution system equipment utilizing industry accepted standards, practices and analysis tools.
 - 1. Provide and install arc flash hazard warning labels as specified on equipment enclosures.
- D. For new facilities, the scope of the system shall include the equipment shown on the one-line power diagram, specified feeder types, and equipment and devices as described in the approved equipment submittal drawings. Feeder lengths shall be appropriately estimated from scale floor plan drawings.
 - 1. The Owner shall provide a one-line power diagram completely illustration the system or portions of the system to be included in the analysis.
 - 2. The Owner shall provide copies of the approved submittal drawings or approved operating and maintenance manuals completely describing the equipment and component devices with electrical ratings, manufacturer, and model numbers.
- E. For existing facilities, the scope of the system shall be ascertained by field survey of the existing system, to include the equipment listed below as may be present on the particular site.
 - 1. Device manufacturer, type, and ratings shall be determined by field survey.
 - 2. Feeder sizes and types shall be determined by field survey.
 - 3. Feeder lengths shall be appropriately estimated by field dimensions.
 - 4. Provide the services of qualified field technical personnel to operate, de-energize and record data which may not be readily observable.
 - 5. Obtain the Owner's permission to de-energize equipment as required and perform those activities on times and dated specified by the Owner.

1.3 QUALITY ASSURANCE

- A. All elements of the studies and analysis shall be performed under the direct supervision and control of a Professional Electrical Engineer licensed in the state where the project is located.
- B. The Professional Engineer shall be experienced in the application of the software employed for a period of not less than three years and shall be able to provide evidence of having performed successful studies of similar magnitude and complexity for electrical distribution systems employing similar devices.

1.4 REFERENCED STANDARDS

- A. IEEE 399 - Recommended Practice for Industrial and Commercial Power Systems Analysis.
- B. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
- C. IEEE 1584 - IEEE Guide for Performing Arc Flash Hazard Calculations.

1.5 DELIVERABLES

- A. Provide two bound copies of complete study and analysis including:
 - 1. Single line power diagrams of the electrical power distribution system utilizing nomenclature consistent with the study input data forms.
 - 2. Fault Current Study:
 - a. Study input data in tabular form.
 - b. Fault current available at each bus or item of equipment, listed in tabular form.
 - c. Required equipment fault current ratings at each bus or item of equipment, listed in tabular form.
 - d. A listing of all components for which the fault current available exceeds the equipment fault current ratings.
 - 3. Coordination Study:
 - a. Coordination study time current curves on log-log axis graphs.
 - b. A listing of all components for which clear coordination cannot be achieved.
 - c. A listing of all components which are not protected within their component ratings.
 - d. Pickup and time delay settings for all adjustable devices in tabular form.
 - e. Fuses elections, ratings and speeds for all replaceable protective devices.
 - 4. Arc Flash Hazard Analysis:
 - a. A listing of the flash protection boundary, incident energy, working distance and hazard risk category for each item of equipment in tabular form.
 - b. Copies of all Arc Flash Information labels provided for the facility.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

- A. Subject to compliance with requirements, companies offering computer software programs that may be used in the Work included, but are not limited to, the following:

1. CGI CYME.
2. EDSA Micro Corporation.
3. ESA, Inc.
4. Operation Technology, Inc.
5. SKM Systems Analysis, Inc.

2.2 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

- A. Comply with IEEE 399.
- B. Analytical features of fault-current-study computer software program shall include “mandatory”, “very desirable”, and “desirable” features as listed in IEEE 399.
- C. Computer software program shall be capable of plotting and diagramming time-current-characteristics curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
- D. Computer software shall be capable of printing Arc Flash information labels for installation on facility electrical equipment enclosures.

2.3 ARC FLASH LABELS

- A. Arc flash labels shall be printed on self-adhesive durable material resistant to fading, moisture, or peeling.

PART 3 EXECUTION

3.1 POWER SYSTEM DATA

- A. Gather and tabulate the following input data to support coordination study:
 1. Product Data for overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective submittals, input and output data, and recommended device settings.
 2. Impedance of utility source of supply.
 3. Electrical Distribution System Diagram:
 - a. Circuit breaker and fuse current ratings and types.
 - b. Relays and associated power and current transformer ratings and ratings.
 - c. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
 - d. Generator kilovolt amperes size, voltage, and source impedance.
 - e. Feeders: Conduit material, sizes of conductors, conductor material, insulation, and length.
 - f. Busway ampacity and impedance.
 - g. Motor horsepower and code letter designation according to NEMA MG 1.
 4. Data sheets to supplement electrical distribution system diagram, cross-reference with tag numbers on diagram, showing the following:
 - a. Special load considerations, including starting inrush currents and frequent starting and stopping.
 - b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
 - c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.

- d. Generator thermal-damage curve.
- e. Ratings, types, and settings of utility company's overcurrent protective devices.
- f. Special overcurrent protective device settings or types stipulated by utility company.
- g. Time-current-characteristic curves of devices indicated to be coordinated.
- h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
- i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
- j. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in ampere rms symmetrical.
- k. Motor controller ratings including reduced voltage types, variable frequency drive ratings, and motor controller bypasses.

3.2 FAULT-CURRENT STUDY

- A. Calculate the maximum available short-circuit current in amperes rms symmetrical at busses and at circuit breaker positions of the electrical power distribution system. The calculation shall be for a current immediately after initiation and for a three-phase bolted short circuit at each of the following:
 - 1. Service main equipment.
 - 2. Switchgear and switchboards.
 - 3. Transformers.
 - 4. Distribution switchboards.
 - 5. Distribution panelboards.
 - 6. Motor-control centers
 - 7. Motor starters and controllers
 - 8. Branch circuit panelboards
- B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.
- C. Calculate momentary and interrupting duties on the basis of maximum available fault current.
- D. Show calculated X/R ratios and equipment interrupting rating (1/2-cycle) fault currents on electrical distribution system diagram.
- E. Equipment Evaluation Report:
 - 1. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1.2-cycle symmetrical fault current.
 - 2. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
 - 3. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

3.3 COORDINATION STUDY

- A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.
 - 1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
 - 2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
 - 3. Calculate the maximum and minimum ground-fault currents.
- B. Transformer Primary Overcurrent Protective Devices:
 - 1. Device shall not operate in response to the following:
 - a. Inrush current when first energized.
 - b. Self-cooled, full load current or forced-air-cooled, full load current, whichever is specified for that transformer.
 - 2. Device settings shall protect transformers from fault currents.
- C. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA-P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
- D. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:
 - 1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
 - a. Device tag.
 - b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
 - c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
 - d. Fuse-current rating and type.
 - e. Ground-fault relay-pickup and time delay settings.
 - 2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
 - a. Device tag.
 - b. Voltage and current ration for curves.
 - c. Three-phase and single-phase damage points for each transformer.
 - d. No damage, melting, and clearing curves for fuses.
 - e. Cable damage curves.
 - f. Transformer inrush points.
 - g. Maximum fault current cutoff point.
- E. Provide completed data sheets for setting of overcurrent protective devices.

3.4 ARC FLASH HAZARD ANALYSIS

- A. Perform an arc flash hazard analysis for the electric power distribution system at each of the following:

1. Service main equipment
2. Switchgear and switchboards
3. Transformers
4. Distribution switchboards
5. Distribution panelboards
6. Motor control centers
7. Motor starters and controllers
8. Branch circuit panelboards

B. Arc flash hazard labels shall be provided and be installed on each item of equipment and shall include the following:

1. "Arc Flash Information" banner
2. Flash protection boundary in inches
3. Incident energy in Cal/cm²
4. Working distance in inches
5. PPE Category per NFPA 70E
6. Shock hazard when cover is open
7. Limited approach in inches
8. Restricted approach in inches
9. Prohibited approach in inches
10. Equipment name
11. Arc flash study date

END OF SECTION

SECTION 26 2213

LOW VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for Coordination of work with other portions of the work.

1.2 DESCRIPTION

- A. Work Included: Provide low voltage distribution power transformers for the conversion of system voltages.
- B. Related Work specified in other sections:
 - 1. 26 00 00 - Electrical
 - 2. 26 28 16 - Enclosed Switches and Circuit Breakers
 - 3. 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 QUALITY ASSURANCE:

- A. The equipment provided shall meet the requirements of the National Electrical Code and local codes and ordinances.
- B. The equipment provided shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

- A. NEMA ST-20 Dry Type Transformers for General Applications
- B. NEMA TP-1 Department of Energy, 10 CFR Part 431 Energy Efficiency
- C. UL 1561 Dry Type General Purpose and Distribution Transformers
- D. ANSI C57.110 IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

1.5 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Submit manufacturer's literature describing equipment for each transformer, including:
 - 1. Outline dimensions.
 - 2. Weight.
 - 3. Allowable conduit entry locations.
 - 4. 1/4" scale layout of proposed equipment location including required working clearances and interference with other equipment.
 - 5. Primary and secondary terminal locations.
 - 6. Cable connection lugs and sizes.
 - 7. Nameplate data and phase diagram.
 - 8. Primary voltage, phase, connections and full load current.
 - 9. Secondary voltage, phase, connections, and full load current.
 - 10. KVA rating.
 - 11. Transformer impedance.

- 12. Designed supports for wall mounted or suspended transformer supports, prepared by a professional structured engineer.
- C. Provide closeout documents as required in Division 1.
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - A. Equipment shall be handled and off loaded in accordance with the manufacturer's published instructions.
 - B. Upon arrival, inspect equipment for damage incurred in shipping.
 - C. Store and protect equipment from moisture and dust by storing in a clean, dry, heated space. Provide additional heavy plastic cover to protect the equipment and components. Provide auxiliary heating in the section in accordance with the manufacturer's recommendations.
- 1.7 MANUFACTURER
 - A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with manufacture of similar equipment.
 - B. Acceptable Manufacturers:
 - 1. Square D Company.
- 1.8 WARRANTY
 - A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

- 2.1 GENERAL
 - A. Transformers shall be general purpose dry type ventilated transformers in NEMA 1 enclosures unless specifically noted on the drawings.
 - B. Transformers shall be of the KVA rating, primary voltage and connection, secondary voltage and connection as indicated on the drawings.
 - C. All insulating materials shall meet NEMA ST20 standards and be rated for 220 Deg.C. insulation system. Transformers shall be designed for 150 Deg.C. temperature rise and maximum temperature of the top of the enclosure of 50 Deg.C., based on an ambient air temperature of 40 Deg.C.
 - D. Transformers 25 KVA and larger shall be provided with full rated primary voltage taps, two 2-1/2% below nominal voltage and two 2-1/2% above nominal voltage.
- 2.2 CONSTRUCTION
 - A. Coils shall be continuous wound aluminum conductor with windings brazed or welded to line and load terminations. Windings shall be vacuum impregnated with thermosetting varnish.
 - B. Cores shall be constructed of high grade silicon steel with low hysteresis and eddy current losses. The core flux density shall be below saturation point to prevent core overheating. Transformers shall be common core, multiple core construction and Scott-T connections are not acceptable.
 - C. Enclosures shall be ventilated and fabricated of code gauge steel construction. Entire enclosure shall be finished with a baked polyester powder coat paint finish, ANSI 49 gray.

The coating shall be U.L. recognized for outdoor use. All terminals and tap connections shall be accessible by removing a front cover plate.

- D. Core and coil shall be bolted to the base of the enclosure by means of rubber vibration isolation mounts.
- E. The core of the transformer shall be grounded to the enclosure by a flexible grounding conductor sized in accordance with U.L. and NEC standards.
- F. The transformer shall be provided with a name plate giving primary and secondary voltages, full load ampacities, transformer impedance and phaser diagram.

2.3 SOUND LEVELS

- A. Sound levels shall not exceed the following:

- 1. 15 to 50 KVA - 39dB
- 2. 51 to 112.5 KVA - 44dB
- 3. 112.5 to 300 KVA - 49dB
- 4. 301 to 500 KVA - 56dB
- 5. 501 to 700 KVA - 58dB
- 6. 701 to 1000 KVA - 64dB
- 7. 1001 to 1500 KVA - 65dB
- 8. 1501 to 2000 KVA - 66dB

2.4 OUTDOOR INSTALLATIONS

- A. For outdoor installations, transformers shall be provided with weather shield for NEMA 3R enclosure designation.

PART 3 EXECUTION

3.1 PREPARATION

- A. Layout exact locations of transformers maintaining required working access, separation from walls, and adequate space for line and load connections as required by NEC.
- B. Transformers shall be floor mounted on four inch concrete housekeeping pads with inserts for anchor bolts.
- C. Transformers may be mounted on wall brackets from building structure or suspended from the floor or roof structure above only when supports designed by a professional structural engineer are submitted to the project engineer for approval.

3.2 INSTALLATION

- A. Transformers installed in a location where the primary over current device does not comply with NEC requirements for a disconnecting means shall be provided with a heavy duty non-fused disconnect switch or molded case switch in a suitable enclosure.
- B. Transformers installed in a location where secondary circuit conductors are in excess of NEC maximum length shall be provided with a heavy duty fused disconnect switch or molded case circuit breaker in suitable enclosure to provide secondary feeder circuit protection.
- C. All transformers shall be installed on suitable neoprene vibration isolation pads to minimize transmission of noise to structure.
- D. Final connection of raceways to transformers shall be by means of flexible liquid tight metal conduit approximately twelve inches in length incorporating one ninety degree bend to minimize the transmission of vibration to the raceway system.

3.3 GROUNDING

- A. Ground transformer secondary to building structural steel or other approved grounding electrode with a grounding electrode conductor in accordance with NEC requirements.
- B. Bond the transformer grounded circuit conductor (neutral) to the grounding electrode conductor on the line side of the transformer secondary over current device.

3.4 ADJUSTMENT

- A. Adjust transformer primary taps to provide nominal name plate secondary voltages when operating at full demand capacity without over-excitement of the primary winding or over-saturation of the transformer core.

3.5 IDENTIFICATION

- A. Provide a permanently affixed engraved nameplate for each transformer giving the transformer name, the source of supply, and the name of the panel or equipment served.

END OF SECTION

SECTION 26 2416

PANELBOARDS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Provide lighting and appliance branch circuit panelboards, circuit breakers and accessories.
- B. Related work specified in other sections:
 - 1. 26 00 00 - Electrical

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

- A. NEMA PB 1 - Panelboards
- B. NEMA PB1.1 - Instructions for Safe Installation, Operation and maintenance of Panelboards Rated 600 Volts or Less.
- C. NEMA AB 1 - Molded Case Circuit Breakers
- D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- E. UL 50 - Enclosures for Electrical Equipment
- F. UL 67 - Panelboards
- G. UL 98 - Enclosed and Dead-front Switches
- H. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures
- I. Federal Specification W-P-115C - Type Class 1
- J. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.

1.5 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Submit Shop Drawings including:
 - 1. Voltage Ratings.
 - 2. Main lug or breaker rating and location voltage ratings.
 - 3. Main Bus Rating.
 - 4. Neutral Bus Rating and location.

5. Ground Bus Rating and location.
6. Thru-feed or sub-feed lug ratings and location.
7. Overall Panelboard Dimensions.
8. Interior Mounting Dimensions.
9. 1/4" scale layout of proposed equipment location including required working clearances, interference with other equipment and available recessing depth where applicable.
10. Location and arrangement of branch breakers.
11. Number of poles, trip ratings, and interrupting ratings of branch breakers.
12. Top and bottom conduit entries and knockouts.
13. Enclosure NEMA Type.
14. Panel deadfront, trim, door, hinge and locking provisions.
15. Manufacturer's literature describing circuit breakers and trip units for each type and frame employed.

C. Provide closeout documents as required in Division 1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.
- B. Upon arrival, inspect equipment for damage incurred in shipping.
- C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.
- D. Conform to NEMA PB2 service conditions during and after installation of panelboards.

1.7 MANUFACTURER

- A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacturer of similar equipment.
- B. Acceptable Manufacturers:
 1. Square D Company.

1.8 WARRANTY

- A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 GENERAL

- A. Interior:
 1. Shall be equal to Square D type NF panelboard for 480 volt and Square D NQOB for 208 volt. Continuous main current ratings, as indicated on drawings.
 2. Minimum Short Circuit Rating:
 - a. 22,000 rms symmetrical amperes at 480Y/277V or as indicated on the Drawings.
 - b. 22,000 rms symmetrical amperes at 208Y/120V or as indicated on the Drawings.

- c. All panelboard components shall be fully rated for the required short circuit interrupting rating. Series rating of devices is not permitted.
- 3. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current rating shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be plated aluminum. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.
- 4. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
- 5. A solidly bonded aluminum equipment ground bar shall be provided. An additional aluminum isolated/insulated ground bar shall also be provided as indicated on the Drawings.
- 6. UL Listed panelboards with 200% rated solid neutral shall be plated aluminum for non-linear load applications. Panelboards shall be marked for non-linear load applications.
- 7. Interior trim shall be dead-front construction to shield user from energized parts. Dead-front trim shall have filler plated covering unused mounting space.
- 8. Nameplate shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, CSA/UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
- 9. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
- 10. Interior phase bus shall be pre-drilled to accommodate field installable options (i.e., Sub-Feed Lugs, Sub-Feed Breakers, and Thru-Feed Lugs).
- 11. Interiors shall accept 125 ampere breakers in group mounted branch construction.

B. Main Circuit Breaker:

- 1. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 Deg.C. ambient environment. Thermal elements shall be ambient compensating above 40 Deg.C.
- 2. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located in the front of the breaker that allows the user to simultaneously select the desired trip level all poles.
- 3. Circuit breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breaker shall be CSA and UL Listed for reverse connection without restrictive line or load markings.
- 4. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.
- 5. Lugs shall be UL Listed to accept solid or standard copper and aluminum conductors. Lugs shall be suitable for 75 Deg.C. rated wire.
- 6. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

C. Branch Circuit Breakers:

1. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the drawings.
2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
3. Circuit breakers shall have an overcurrent toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
4. The exposed faceplates of all branch circuit breakers shall be flush with one another.
5. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 Deg.C. rated wire.
6. Breakers shall UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.
7. Breaker shall be UL Listed with the follow ratings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), (15-20A) Switch Duty (SWD), (15-50A) Equipment Protection Device (EPD) (480Y/277Vac maximum).

D. Enclosures:

1. Type 1 Boxes
 - a. Boxes shall be hot zinc dipped galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvanized steel not acceptable.
 - b. Boxes shall have removable endwall with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
 - c. Box width shall not exceed 20" wide.
2. Type 1 Fronts
 - a. Front shall meet strength and rigidity requirements per UL 50 Standards. Shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
 - b. Mounting shall be flush, or surface as indicated on the Drawings.
 - c. Front shall have flat latch type lock with catch and spring-loaded stainless-steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
 - d. Fronts shall be hinged door-in-door construction with front trim connected to enclosure with continues piano hinge and latch to access all wiring and termination without removing the door from the enclosure. A separate door, hinge and latch shall be provided to access the deadfront compartment to provide access to main and branch breaker operating handles with no exposure to energized parts.
3. Type 3R
 - a. Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
 - b. All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One 91) key

- shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
- c. Maximum enclosure dimensions shall not exceed 21" wide and 9.5" deep.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.
- B. Provide panelboard supports to the building structure independent of raceways.

3.2 FIELD QUALITY CONTROL

- A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.
- C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

3.3 IDENTIFICATION

- A. Provide engraved panelboard nameplate permanently affixed to the panel door, giving panelboard name designation, system voltage, and name of the panelboard supply source.
- B. Provide a neatly typewritten circuit directory card in card holder inside panel door describing the name and location of devices served by each branch breaker using numbers finally established at the project.

3.4 FUTURE PROVISIONS

- A. From each flush mounted panelboard section, provide a minimum of two 1" conduits stubbed into the accessible ceiling and/or crawl space, as may be available, for future branch circuit wiring.
- B. Provide a pull cord in all future conduits with identifying tags on both ends.

3.5 COORDINATION OF LOADS SERVED

- A. Confirm that all branch circuit breakers are of the proper type and configuration for the loads finally connected:
 - 1. HCAR Rated.
 - 2. HID Rated.
 - 3. GFCI Rated.
 - 4. AFCI Rated.
 - 5. Three pole common trip breakers for multi-wire branch circuits.
- B. Reconnect loads, rearrange branch circuit breakers or provide new breakers as required to ensure branch circuit breakers are proper type and properly rated for the loads finally connected.

3.6 CLEANING

- A. Throughout the construction period, maintain panelboards and interiors free of dust, debris, wire trimmings, etc. Provide heavy duty plastic barriers as required.
- B. Before final acceptance, thoroughly clean panelboards and interiors and vacuum clean to a dust free condition.

END OF SECTION

SECTION 26 2716

ELECTRICAL CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 REFERENCE DOCUMENTS

- A. Conditions of the Contract and Division 01 - General Requirements are hereby made a part of this section.
- B. All sections of this specification.

1.2 DESCRIPTION

- A. Work Included: Provide cabinets for the installation of wiring and equipment.
- B. Related work specified in other section:
 - 1. 26 00 00 - Electrical
 - 2. 26 24 16 - Panelboards
 - 3. 26 28 16 - Enclosed Switches and Circuit Breakers
 - 4. 26 05 23 - Control Voltage Electrical Power Cables

1.3 QUALITY ASSURANCE

- A. Source Quality Control: Tests to meet applicable Underwriters' Laboratories, Inc. Standards.
- B. Reference Standards:
 - 1. Underwriters' Laboratories, Inc. applicable Standards.
 - 2. National Electrical Code.
- C. Design Criteria: National Electrical Manufacturer's Association construction types based on environment.
 - 1. Indoor: NEMA Type 1
 - 2. Outdoor: NEMA Type 3R

1.4 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Shop Drawings shall include dimensions, knockout sizes and locations, material types and gauges, finishes, and installation methods.
- C. Certificates shall include labels of Underwriters' Laboratories, Inc., and National Electrical Manufacturer's Association affixed to each item.
- D. Provide closeout documents as required in Division 1.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Square D Company.

2.2 MATERIALS

- A. For Panelboards:

1. Same manufacturer as panelboard, boxes of code gauge steel, welded with edges turned to receive trim, and galvanized.
2. Trim and doors No. 12 gauge steel minimum, hinged door, flush tumbler lock and catch keyed alike throughout the work, factory enamel finish, suitable for field color coat.
 - a. Flush: Overlap minimum 3/4 inches top, bottom, and sides.
 - b. Surface: Same size as cabinet.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine structure to which cabinets are to be secured for defects which affect the execution and quality of work.
- B. Do not start work until defects are corrected.

3.2 PREPARATION

- A. Carefully measure and lay out exact locations.
- B. Provide supports.

3.3 INSTALLATION

- A. Provide cabinets where indicated and where necessary.
- B. Provide flush type in finished areas centered in paneling and other Architectural features.
- C. Provide surface type in equipment rooms, above accessible finished ceilings, and in crawl spaces.
- D. Install lighting and power cabinets with tops 6 feet 6 inches above finished floor.
- E. Install cabinet trim and doors straight and plumb.

3.4 CABINET IDENTIFICATION

- A. Cabinets for all panelboards, switchboards, disconnect switches, transformers, motor starters, and electrical equipment furnished shall be provided with engraved phenolic lamacoid plastic name plates with 1/2-inch block engraving.
- B. Name plates shall give equipment designation as scheduled on the drawings, circuit number designation, and voltage and phase of service.

3.5 ADJUSTMENT AND CLEANING

- A. Adjust trims and doors for vertical and horizontal alignment.
- B. Clean surfaces to be painted.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide wiring devices and cover plates for outlets designated to receive them.
- B. Related work specified in other section:
 - 1. 26 00 00 - Electrical
 - 2. 26 05 33 - Boxes for Electrical Systems

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

- A. U.L. 20 - General Use Snap Switches.
- B. U.L. 498 - Attachment Plugs and Receptacles.
- C. U.L. 1682 - Plugs, Receptacles and Cable Connectors of the Pin and Sleeve Type.
- D. NEMA WD-1 General Color Requirements for Wiring Devices.
- E. NEMA WD-6 Configurations for Specific Purpose Plugs and Receptacles.
- F. Federal Specification WS-896 Switches, Toggle, Flush mounted.
- G. Federal Specification WC-596 Connector, Electrical Power.

1.5 SUBMITTALS

- A. Samples: Provide samples upon specific request.
- B. Submit product data under provisions of section 26 00 00 Electrical.
- C. Provide closeout documents as required in Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver devices and cover plates in manufacturer's sealed unopened packages and protect from the introduction of dust and moisture.
- B. Do not install wiring devices and cover plate until adjacent finishes are complete and the area has been cleaned to a dust free dry environment.

1.7 MANUFACTURER

- A. The equipment shall be the product of a manufacturer with at least ten years experience in the manufacture of similar equipment.
- B. All wiring devices on the project shall be of the same manufacturer where rated 50 amperes or less.
- C. Acceptable manufacturers:
 - 1. Leviton.
 - 2. Hubbell.
 - 3. Legrand.
 - 4. Cooper.

PART 2 PRODUCTS

2.1 GENERAL

- A. Unless noted otherwise, wiring devices shall be industrial grade devices, gray color, with Type 302 stainless steel covers.
- B. All 120V straight blade receptacles shall be commercial grade, tamper proof design.
- C. Where required by the National Electrical code or local codes and ordinances, receptacles shall be commercial grade GFCI type, matching color with other wiring devices in the area, with matching polycarbonate cover plate.

2.2 INDUSTRIAL GRADE DEVICES

- A. Shall be equal to the devices listed below.
- B. Switches
 - 1. Single pole wall toggle, Leviton 1221-2.
 - 2. Three way wall toggle, Leviton 1223-2.
 - 3. Single pole key toggle, Leviton 1221-2KL.
 - 4. Three way key toggle, Leviton 1223-2KL.
 - 5. Single pole, double throw, center off maintained contact, Leviton 1285.
 - 6. Single pole, double throw, center off momentary contact, Leviton 1257.
 - 7. Single pole, pilot light, Leviton 1221-PL. P&S PS20AC1CPL.
 - 8. Single pole, lighted handle, Leviton 1221-LH. P&S PS20AC15L.
- C. Straight Blade Receptacles
 - 1. 125V, 20A, 5-20R, Simplex, Leviton T5361.
 - 2. 125V, 20A, 5-20R, Duplex, Leviton T5362.
 - 3. 250V, 20A, 6-20R, Simplex, Leviton 5461.
 - 4. 250V, 20A, 6-20R, Duplex, Leviton 5462.
 - 5. 125V, 30A, 5-30R, Simplex, Leviton 5371.
 - 6. 250V, 30A, 6-30R, Simplex, Leviton 5372.
 - 7. 125/250V, 10-30R, Simplex, Leviton 5207.
 - 8. 125/250V, 30A, 14-30R, Simplex, Leviton 278.
 - 9. 125/250V, 5-20R, Simplex Clock Hanger, Leviton T5361-CH.
- D. Locking Type Receptacles
 - 1. 125V, 20A, L5-20R, Simplex, Leviton 2310.
 - 2. 250V, 20A, L6-20R, Simplex, Leviton 2320.
 - 3. 125V, 30A, L5-30R, Simplex, Leviton 2610.
 - 4. 250V, 30A, L6-30R, Simplex, Leviton 2620.

E. GFCI Receptacles

1. 125V, 20A, 5-20R, Duplex, Commercial Grade, Leviton GFTR2.

2.3 WEATHER RESISTANT DEVICES

- A. Where noted on the drawings or located exterior to the building, wall switches shall be provided with die cast zinc weatherproof, gasketed cover plate with NEMA 3R classification in wet locations.
- B. Where noted on the drawings or located exterior to the building, wall receptacles shall be provided with die cast zinc weatherproof gasketed cover plates with NEMA 3R classification, listed for in use unattended plugs in wet locations.

2.4 MOTOR RATED SWITCHES

- A. Fractional horsepower motors with internal overload protection shall be provided with double pole or three pole manual motor starting switches equal to Leviton MS series.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Align wiring device covers vertically and horizontally and assure flush fit to wall surface.
- B. Surface mounted devices in cast ferrous boxes shall be furnished with stamped steel galvanized face plates.

3.2 IDENTIFICATION

- A. Each receptacle shall be provided with a permanently affixed name plate giving the panelboard and branch circuit number supplying the outlet.
- B. Identification shall be on the outside of the cover plate.
- C. Manual Motor Rated Switches and Combination Switch and Receptacle Outlets shall be provided with permanently attached engraved phenolic name plates giving the panel and branch circuit source of supply and the name of the device controlled.
- D. Unless noted otherwise, all receptacles connected to a supply from a standby generator source shall be red color.
- E. Unless noted otherwise all receptacles connected to a supply from an uninterruptible power system source shall be orange color.

END OF SECTION

SECTION 26 2813

FUSES

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for Coordination of work with other portions of the work.

1.2 DESCRIPTION

- A. Work Included: Provide low voltage fuses for overcurrent protection in fusible devices.
- B. Related Work specified in other sections:
 - 1. 26 00 00 - Electrical
 - 2. 26 24 16 - Panelboards
 - 3. 26 28 16 - Enclosed Switches and Circuit Breakers

1.3 QUALITY ASSURANCE

- A. The equipment provided shall meet the requirements of the National Electrical Code and local codes and ordinances.
- B. The equipment provided shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCE STANDARDS

- A. NEMA FU1 Low Voltage Cartridge Fuses
- B. UL 248 Low Voltage Fuses

1.5 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Product Data: Provide manufacturer's bulletins, and minimum melting and total clearing time charts for each type of fuse.
- C. Provide closeout documents as required in Division 1.

1.6 JOB CONDITIONS

- A. Deliver fuses to the project in the manufacturers new unopened shipping containers.
- B. Store fuses in a clean, dust free, cool environment until required for installation to energize equipment.

1.7 MANUFACTURER

- A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.
- B. Acceptable Manufacturers
 - 1. Bussman
 - 2. Littlefuse
 - 3. Ferraz - Shawmut

1.8 WARRANTY

- A. Fuses shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 FUSES - 600A AND BELOW

- A. All fuses shall have a separate overload and short-circuit elements. Fuses shall incorporate a spring activated thermal overload element that has a 284 degrees Fahrenheit melting point alloy.
- B. The fuses shall have time-delay capabilities in accordance with UL standards for Class RK1, J, or CC fuses and an interrupting rating of 300,000 amperes RMS symmetrical, listed by a nationally recognized testing laboratory.
- C. Peak let-through currents and I²t let-through energies shall not exceed the values established by UL for Class RK1 or J fuses.

2.2 MOTOR CIRCUITS

- A. The fuses shall be applied for all motors protected by properly sized overload relays:
 - 1. Class RK1 fuses shall be installed in ratings of 130%, or 150% for Class J fuses, of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized at 175% of the motor full-load current, or the next standard size larger if 175% does not correspond to a standard fuse size.
 - 2. Class L fuses shall be installed in ratings of 175% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized up to 300% (or next size smaller).
 - 3. Class CC fuses shall be installed in ratings of 200% of motor full-load current (or next size larger if this does not correspond to a fuse size), except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuses may be sized up to 400% (or next size smaller).
 - 4. Fuses shall be tested and have documentation verifying compliance of Type 2 protection requirements for motor starters per UL508E or IEC 60947-4 for motor controllers.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Fuses shall not be installed until equipment is ready to be energized. This measure prevents fuse damage during shipment of the equipment for the manufacturer to the job site, or from water that may contact the fuse before the equipment is installed.
- B. Final tests and inspections shall be made prior to energizing the equipment. This shall include a thorough cleansing, tightening, and review of all electrical connections and inspection of all grounding conductors.

3.2 SPARES

- A. In addition to fuses consumed during testing, furnish 10%, but not less than three of each, of each size and type fuse used for the project, and store in spare fuse cabinet.
- B. Provide Bussmann SFC spare fuse cabinet in main electrical room.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide disconnect switches and enclosed circuit breakers for branch circuit, motor circuits, and items of equipment.
- B. Related work specified in other sections:
 - 1. Division 23
 - 2. 26 00 00 - Electrical
 - 3. 26 28 13 - Fuses

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.

1.4 REFERENCED STANDARDS

- A. UL 50 Cabinets and Boxes
- B. UL 98 Enclosed and Deadfront Switches
- C. UL 489 Molded Case Circuit Breakers
- D. UL 977 Fused Power Circuit Devices
- E. NEMA AB1 Molded Case Circuit Breakers and Molded Case Switches
- F. NEMA KS1 Enclosed Switches

1.5 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Submit shop drawings including:
 - 1. Enclosure outline drawings and dimensions.
 - 2. Nameplate schedule.
 - 3. Assembly ratings including:
 - a. Main lug ratings and location.
 - b. Voltage ratings.
 - c. Short circuit ratings.
 - 4. Conduit entry and exit locations, dimensions, and knock-outs.
 - 5. Cable terminal sizes.
 - 6. Fuse types and ratings.
 - 7. Manufacturer's literature describing circuit breakers and trip units.

- C. Provide closeout documents as required in Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be handled and off loaded in accordance with the manufacturer's published instructions.
- B. Upon arrival, inspect equipment for damage insured in shipping.
- C. Store and protect equipment from moisture and dust by storing in a clean, dry, heated space. Provide additional heavy plastic cover to protect the equipment and components. Provide auxiliary heating in the sections in accordance with the manufacturer's recommendations.

1.7 MANUFACTURER

- A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.
- B. Acceptable Manufacturers:
 - 1. Square D Company.

1.8 WARRANTY

- A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Enclosed Switches
 - 1. Provide enclosed switches where indicated on the drawings or required by NEC.
 - 2. Switches shall be NEMA Type HD, heavy duty, rated 600 volts, with quick-make, quick break switch units and external operator, rated 100,000 A.I.C.
 - 3. Switches shall be fused or unfused as shown on the drawings and as required by NEC, capacity and number of poles as indicate don the drawings.
 - 4. Enclosures shall be provided with interlocks to prevent opening the enclosure without first opening the switch and to prevent operating the switch with the enclosure open.
 - 5. Enclosures shall be provided with a means for pad locking in the open position.
 - 6. Enclosures shall be provided with an equipment grounding lug.
 - 7. Enclosures for use on four wire shall be provided with an insulated neutral bus.
 - 8. Line side and load side terminals shall be provided with insulating cover to prevent accidental contact.
 - 9. Indoor locations shall be provided with NEMA Type 1 Enclosures.
 - 10. Outdoor locations shall be provided with NEMA Type 3R Enclosures and watertight threaded hubs for conduit entry.
- B. Enclosed Circuit Breakers
 - 1. Provide enclosed circuit breakers or molded case switches where indicated on the drawings or required by the NEC.
 - 2. Circuit breaker for rating 250 amperes or less shall be thermal magnetic molded case circuit breakers.

3. Circuit breakers 300 amperes through 1200 amperes shall be molded case, 100% rated, electronic trip, microprocessor based, true RMS sensing, with adjustable, defeatable instantaneous pickup.
4. Units shall be 600 volt or 250 volt as required and unless noted otherwise shall be 42,000 A.I.C.
5. Enclosures shall be provided with a means for pad locking in the open position.
6. Enclosures shall be provided with and equipment ground bus.
7. Enclosures for use on four wire systems shall be provided with an insulated neutral bus.
8. Line side and load side terminals shall be provided with insulating covers to prevent accidental contact.
9. Indoor locations shall be NEMA Type 1 Enclosures.
10. Outdoor locations shall be NEMA Type 3R enclosures and watertight hubs for threaded conduit entry.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect building structure to which disconnects are to be secured for defects which affect the execution and quality of work.
- B. Do not start work until defects are corrected.

3.2 PREPARATION

- A. Carefully measure and lay out exact locations maintaining working clearances required by the National Electrical Code.

3.3 INSTALLATION

- A. Provide disconnects where indicated and where required by the National Electrical Code and all equipment where integral disconnects are not provided by the manufacturers.
- B. Provide disconnects mounted to building structure ahead of flexible conduit final connection to each fan powered terminal box.
- C. Install within sight of equipment served.
- D. Provide final connection to equipment served.
- E. Provide engraved lamicoid name plate secured to cabinet with designation of equipment served, operating voltage, and circuit designation.

END OF SECTION

SECTION 26 5101

INTERIOR LIGHTING

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide LED lighting fixtures and accessories for interior illumination of the building.
- B. Related work specified in other Sections:
 - 1. 26 00 00 - Electrical
 - 2. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 3. 26 05 29 - Hangars and Supports for Electrical Systems
 - 4. 26 05 32 - Raceways
 - 5. 26 05 33 - Boxes for Electrical Systems
 - 6. 26 51 05 - Networked Lighting Controls

1.3 QUALITY ASSURANCE

- A. The equipment supplied and installed shall meet the requirements of the National Electrical Code and all applicable local codes and ordinances.
- B. All equipment supplied shall be Underwriter's Laboratories Inc. listed and so labeled.
- C. Laboratory Testing: Photometric testing shall be by Independent Testing Laboratories, Inc., based on Illuminating Engineering Society published procedures, and shall include candlepower distribution tabulation and zonal cavity coefficient of utilization tabulation.

1.4 REFERENCE STANDARDS

- A. Underwriters' Laboratories No. 57 - Fixtures, Electric Lighting.
- B. Underwriters' Laboratories No. 924 - Emergency Lighting and Power Equipment.
- C. Underwriters' Laboratories No. 1598 - Luminaires
- D. Underwriters' Laboratories No. 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

1.5 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Submit manufacturer's literature giving materials, finishes, dimensions, coefficients of utilization, and lamp types for each fixture which is the product of one of the listed acceptable manufacturers.
- C. Submit large scale shop drawings and copies of independent testing laboratory test report, along with manufacturer's literature for each fixture which is the product of any manufacturer not listed as acceptable.
- D. Submit samples of fixtures upon specific request.

- E. Certificates: Labels of Underwriters' Laboratories, Inc.; affixed to each item of material.
- F. Provide closeout documents as required in Division 1.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Equipment shall be included and off loaded in accordance with the manufacturer's published instructions.
- B. Upon arrival, inspect equipment for damage incurred in shipping.
- C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 MANUFACTURER

- A. The equipment shall be the product of a manufacturer with a minimum of ten years' experience with the manufacturer of similar equipment.
- B. Listed in schedule and with materials.

1.8 WARRANTY

- A. The equipment shall be warranted to be in proper working order for a period of one year following the date of final acceptance.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Lighting Fixtures:
 - 1. Fixtures shall be of the lighting fixture types scheduled on the drawings according to the letter type designations on the plans.
 - 2. If letter type designation is omitted from any fixture shown on the plans, provide the same fixture type as employed in rooms of similar usage.
 - 3. Where manufacturer's model numbers are used to describe fixtures, the intent is to establish the kind and quality of the fixture. The Contractor is responsible for examining the drawings to establish correct ordering information for each fixture including but not limited to voltage for the branch circuit supply, ceiling trim and mounting means for the ceiling material.
 - 4. The contractor shall coordinate light fixture mounting frames and accessories with the ceiling type actually being furnished. Refer to final Architectural Reflected Ceiling Plan and related submittals prior to confirming mounting frames and accessories. Light fixture submittals shall be based on this level of coordination occurring prior to submittals being generated by the contractor.
- B. Exit Signs:
 - 1. Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal

voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

- d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
- e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
- f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

C. LED Source Package Lamps:

- 1. LED fixtures, source packages, arrays or modules and power supplies shall be UL 1598 and 2043 listed.
- 2. LED source packages, arrays or modules and power supplies shall be tested in accordance with LM-79/LM80.
- 3. LED light source packages, arrays or modules shall be tested in accordance with LM-80 depreciation test and L70 rated life result shall be a minimum of 50,000 hours.
- 4. LED lamp color temperature of 4000K with minimum 80% CRI is required for LED lamps. Lamp lumen minimum values as scheduled.
- 5. Luminaire power factor shall be minimum 90%.
- 6. LED fixtures, source packages, arrays or modules and power supplies shall be Design Lights Consortium (DLC) qualified.

D. LED Power Supplies/Drivers:

- 1. LED power supplies shall operate LEDs within the current limit specification of the manufacturer.
- 2. Shall operate from 60 Hz input source and have input power factor >90% and a minimum efficiency of 70% at full rate load of the driver.
- 3. Shall have short circuit and overload protection.
- 4. Shall have a minimum starting temperature of 0°F and a maximum case temperature rating of at least 70°F.
- 5. Power supply output shall be regulated to ±5% across published load range.
- 6. Shall have as Class A sound rating.
- 7. Shall comply with the requirements of the Federal Communications Commission (FCC) rules and regulations, Title 47CFR part 15, non-consumer (Class A) for EMI/RFI.
- 8. Shall contain no PCBs.
- 9. Shall carry a five (5) year minimum warranty from date of manufacturer against defects in materials or workmanship, including a replacement for operation at or below the maximum case temperature specification. For LED lamps and internal power regulation components for defects resulting in a fixture lumen depreciation >30%.
- 10. Dimmable power supplies shall allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

E. Emergency Lighting Units with Battery Packs:

- 1. Self-contained units complying with UL 924.
 - a. Battery: Sealed, maintenance-free, lead-acid type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp

automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

- d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.
- F. LED Source Package Lamps:
- 1. LED fixtures, source packages, arrays or modules and power supplies shall be UL 1598 and 2043 listed.
 - 2. LED source packages, arrays or modules
- G. Lighting Fixture Support Components:
- 1. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
 - 2. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
 - 3. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
 - 4. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).
 - 5. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).
 - 6. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
 - 7. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- H. Accessories: Manufacturers' standard mounting ring, trim flanges, hanger bars, spacers, supports, plaster frames of non-ferrous material or cadmium plated steel. Do not use painted steel plaster frames.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect Architectural drawings and specifications, including ceiling alternates, to determine ceiling material to be installed.
- B. Inspect Architectural reflected ceiling plans.
- C. Inspect installed ceiling components and pole bases for defects affecting the quality and execution of work.

3.2 PREPARATION

- A. Verify ceiling material, type, support method and alignment.
- B. Layout exact locations of fixtures in accordance with reflected ceiling plans, fixtures' and switches' outlet boxes and supports, and poles and standard bases.
- C. Provide specified outlet boxes and conduit system for the light fixtures including conduit support system.
- D. All lighting fixtures shall be supported from building structure. Do not support lighting fixtures from the ceiling system. Fixtures shall be supported by supplementary hangars located within 6 inches of each corner, or supported independently from the structure. Do not support lighting fixtures from other building systems located above the ceiling such as fire sprinkler piping, HVAC piping, plumbing piping, equipment or ductwork.

3.3 INSTALLATION

- A. Provide lighting fixtures, control systems and wiring.
- B. If designation omitted on drawings, provide same type fixtures employed in rooms of similar usage.
- C. Provide spacers for fixtures mounted on low density ceiling material.
- D. Provide plaster frames for recessed fixtures in plaster or gypboard ceilings.
- E. Install fixtures in and on acoustical tile ceilings in alignment with tile joints.
- F. Install fixtures in gypsum board ceilings to recess in the space available between structural members where the ceiling is installed tight against the structure.
- G. Install in accordance with manufacturer's instructions, submittal data, and details on the drawings.

3.4 ADJUSTMENT AND CLEANING

- A. Adjustment: Adjust lamp positions for desired effects. Align fixtures with building walls and tile joints.
- B. Cleaning: Remove dirt, grease, and foreign materials from fixtures. Remove fingerprints, smudges, and dirt from fixture's lenses and lamps.

3.5 LIGHTING FIXTURE SCHEDULE

- A. Reference drawings for Lighting Fixture Schedule.

END OF SECTION

SECTION 26 5105

NETWORKED LIGHTING CONTROLS

PART 1 GENERAL

1.1 REFERENCED DOCUMENTS

- A. Comply with Division 1 - General Requirements and related documents.
- B. Comply with all other Division 26 sections as applicable.
- C. Refer to other Divisions for coordination of work with other portions of work.

1.2 DESCRIPTION

- A. Work Included: Provide a distributed, low voltage, lighting controls system with networked devices. Provide full web based central control software with lighting controls graphical user interface from an owner's networked PC.
- B. Related work specified in other Sections:
 - 1. 26 00 00 - Electrical
 - 2. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 3. 26 95 32 - Raceways
 - 4. 26 05 33 - Boxes for Electrical Systems
 - 5. 26 51 01 - Interior Lighting
 - 6. 26 51 02 - Exterior Lighting

1.3 QUALITY ASSURANCE

- A. Factory Assembly: All system components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and network terminations. All connections shall be made to clearly and permanently labeled termination points. Systems that require field assembly shall not be acceptable.
- B. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.
- C. NEC Compliance: All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.
- D. NEMA Compliance: All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
- E. UL Approval: All applicable equipment shall be tested to and listed under UL standard 508 and shall bare labels to indicate compliance. Lighting control relays shall be tested to UL standard 508 for both safety and endurance. System listed other ETL, or other UL sections shall provide documentation proving compliance with UL standard 508.

1.4 SUBMITTALS

- A. Submit product data under provisions of section 26 00 00 Electrical.
- B. Submittals shall include, but not be limited to, the following:
 - 1. Product data on all lighting control system components and accessories.
 - 2. Reflected ceiling plan drawings showing specific locations of occupancy sensors for lighting control including lines delineating sensor effective range,

- with and without furniture system partitions, sensor type, sensor mounting, and other pertinent data to allow evaluation of the proposed system.
 - 3. Wiring diagrams for occupancy sensors, related control units, and override switches including an overall system riser diagram.
 - 4. Make submittals in accordance with Division 01.
 - 5. Submit factory approved lighting controls layout showing all devices and proposed devices locations.
 - 6. Sample graphical user interface showing sample home page, floor plan graphics with lighting control zones, and sample scheduling and override features.
- C. Provide closeout documents as required in Division 1.
- 1.5 DELIVERY STORAGE AND HANDLING
- A. Deliver devices and cover plates in manufacturer's sealed unopened packages and protect from the introduction of dust and moisture.
 - B. Do not install sensors and cover plate until adjacent finishes are complete and the area has been cleaned to a dust free dry environment.
- 1.6 MANUFACTURER
- A. The equipment shall be the product of a manufacturer with a minimum of ten years experience with the manufacture of similar equipment.
 - B. Acceptable Manufacturer
 - 1. Acuity
 - 2. Eaton
- 1.7 WARRANTY
- A. Provide a five-year parts and one year labor warranty. Warranty coverage shall begin at the time of Project Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL

- A. Summary:
 - 1. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.
 - 2. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed). Specific dimmers will be capable of "dimming lights to off".
 - 3. All system devices shall be networked together, enabling digital communication between devices, and shall be individually addressed.
 - 4. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.
 - 5. The system architecture shall facilitate remote operation via a computer connection.
 - 6. The system shall not require any centrally hardwired switching equipment.
 - 7. The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.
- B. System Requirements:

1. System shall have an architecture that is based upon three main concepts: 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time-based operation.
2. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
3. System must interface directly with intelligent LED luminaires such that only plenum rated CAT-5 cabling is required to interconnect luminaires with control components such as sensors and switches (see Networked LED Luminaire section).
4. Intelligent lighting control devices shall communicate digitally, require <7 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
5. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher-level network backbone.
6. Devices within a lighting control zone shall be connected with plenum rated CAT-5e low voltage cabling in any order.

2.2 DIGITAL ROOM CONTROLLER

- A. As indicated and where shown on the plans, install room controllers to control the quantity of lighting and plug loads required.
- B. Room controllers shall provide 0 - 10 volt dimming capability for the required number of lighting loads.
- C. Room controllers shall integrate the functionality of connected control components including wall switch stations, occupancy sensors and daylight sensors to provide the required sequence of operation for the space.
- D. Room controllers and associated room control components shall operate in a totally stand-alone mode and not require the use of a network, software, computer or server for local control and time-based functions.
- E. Functional:
 1. Provide an integral pushbutton and LED indicator for each load for status and to allow operation of the relays and dimmers for testing and verification without requiring other control devices to be connected.
 2. The room controller shall have a default operation providing an automatic logical sequence of operation for each load as the room control devices are plugged into the Smart Port connectors.
 3. Default operation for occupancy sensors shall be automatic on, automatic off for all loads.
 4. Upon connection of a switch, the operation shall automatically change to manual on, automatic off (vacancy) mode for all loads.
 5. Provide capability to convert each load independently to automatic on or vacancy mode using only the integral push buttons and LED indicators on the room controller.
 6. When in vacancy mode, provide a 30 second grace period after an off during which automatic on shall be temporarily enabled.
 7. It shall be possible to connect up to eight (8) room controllers together using Cat5 patch cables to provide configurations up to 16 switched and dimmed loads operating as a single zone.

8. Provide the following set up and configuration functions without the need for additional devices or software:
 - a. Assign/reassign relays for control by wall switch station buttons.
 - b. Configure relays for occupancy or vacancy operation.
 - c. Assign/reassign dimmers to raise/lower switches.
 - d. Assign dimming channels for response to daylight sensor control.
 - e. Auto calibrate default daylight sensor sequence of operation
 - f. Save preset scenes.

2.3 NETWORK BRIDGE MODULE

- A. The network bridge module allows multiple room controller zones to be networked with other system devices for whole building administration of lighting control functions.
- B. The bridge shall connect to and be powered from a room controller smart port via a standard plenum rated Cat5 cable.
- C. Two additional RJ-45 ports on the bridge shall provide an in and out connection point for an Ethernet based network.
- D. The network bridge module shall provide a communication link between the room control devices and the system area controller via an Ethernet based network. At a minimum, the network link shall provide the following functionality through a web browser user interface:
 1. Report the current occupancy status for each lighting control zone.
 2. Indicate the status of each relay and dimming channel.
 3. Allow reconfiguration of system device input and output parameters.
 4. Report the real time power consumption for each Room Controller.
 5. Set up daylight harvesting for zones equipped with photocells.
 6. Configure and download schedules to panels and Room Controllers.

2.4 LIGHTING CONTROL PANELS

- A. Panels shall be configured with the quantity of relays and 0 - 10 volt dimming channels as indicated.
- B. Functional:
 1. The lighting control panels shall be of the distributed intelligence type and shall not be dependent a network connection to execute schedules or perform programmed functions.
 2. Relays, dimmers, and low voltage inputs shall be assignable to control zones as required via the web browser user interface.
 3. Each panel shall have low voltage input terminals for connection of Class 2 devices.
 4. Inputs shall be programmable to support momentary or maintained contact types and shall provide for alternate action on/off, on only, off only, raise, lower, timed on or preset recall operation.
 5. Each panel shall provide capability to control external devices through integral form-C low voltage contacts.
 6. Dimming outputs shall be industry standard 0 - 10-volt current sinking type and provide continuous dimming for compatible dimming ballasts and LED drivers.
 7. Dimming channels shall be assignable to control zones as required via the web browser user interface.
 8. Dimming channels shall be configurable to respond to manual raise/lower wall switch control stations, preset scenes, or daylight harvesting photocells.

2.5 LOW VOLTAGE SWITCH STATIONS

- A. Low voltage digital wall switch stations shall be of the programmable type using plenum rated Cat5 cabling for connection to system smart port.
- B. Stations shall have one to six buttons and provide lighting control functions as called out and shown on the plans.
- C. All switches shall be single gang and be of the generic decorator style allowing easy ganging and use of a wide array of standard wall switch plate options.
- D. Provide two RJ-45 ports per switch to allow for daisy chain connection of up to eight switches to each smart port.
- E. Switch station color shall be white with white cover plates.

2.6 OCCUPANCY / VACANCY SENSORS

- A. Occupancy sensors shall be ceiling or wall mounted and use dual technology (ultrasonic and passive infrared), ultrasonic and/or passive infrared (model specific) sensing technology as indicated.
- B. Sensors shall be Class 2 and connect to any room controller smart port using a wiring adaptor and standard Cat5 patch cable.
- C. Occupancy sensors shall be self-adaptive and not require manual calibration after installation. Digital circuitry and logic shall automatically make adjustments to the sensitivity and time delay based on learned occupancy patterns and the environment in which the sensor is installed.
- D. Sensors using both ultrasonic and passive infrared (dual technology) shall operate such that detection by both technologies is required to initiate occupancy and continued detection by either technology will maintain occupancy.
- E. Up to four occupancy sensors may be connected to one room controller.

2.7 DAYLIGHT SENSORS

- A. Daylight sensors shall provide ambient light level information to the room controller allowing daylight responsive lighting control.
- B. The system shall operate in an open loop sequence of operation reducing the amount of electric light as the quantity of daylight entering the room increases.
- C. It shall be possible to configure up to six daylight zones in a room. Each zone shall be programmable to proportionally respond to the light level provided by the daylight sensor.
- D. The daylight sensor shall be mounted and positioned to provide an unobstructed view of the windows per the manufacturer's directions.

2.8 AREA CONTROLLER

- A. Web browser-based system programming, monitoring and administration shall be provided by the area controller.
- B. The Area Controller shall have the ability to communicate by means of TCP/IP over Ethernet allowing enterprise connectivity between the NX Distributed Lighting Control System and external LAN or WAN networks.
- C. Provide integral capability to communicate with the Building Automation System via BACnet IP protocol.

2.9 EXTERIOR WIRELESS LIGHTING CONTROLLERS

- A. All wireless lighting controllers shall provide the following features and capabilities:
 - 1. 0-10VDC (sinking) dimming control in 0.1V increments based on LED driver high and low operating range; 0V turns fixture power OFF.
 - 2. Direct motion detector interface/motion detector input when required.
 - 3. Scheduled control.
 - 4. Over the air flashing (program updates).
- B. Wireless Outdoor Lighting Controller (externally top mounted)
 - 1. Nodes shall be a one-piece, self-contained IP66-rated device, externally mounted, capable of providing 0-10VDC dimming, bi-level and on and off control to luminaire with the following features:
 - a. Twist lock mounting via NEMA ANSI 136.41 7-pin connector.
 - b. Controller shall consist of a completely self-contained distributed intelligent wireless lighting controller capable of functioning completely independently including time based and astronomical scheduling of On/Off and preset events without the need of any coordinator, gateway of master controller.
 - c. Controller shall be configurable remotely over the air utilizing built in Bluetooth radio an iOS or Android handheld device or via Wireless HUBBnet network.
 - d. Controller shall be capable of having its device firmware updated wirelessly.
 - e. Controller shall include non-volatile memory for retaining device settings during power outages.
 - f. Controller shall include an integrated daylight sensor.
 - g. Controller shall support universal input voltage (120-480VAC, 50/60Hz).
 - h. Controller shall include one SPST relay for On/Off control.
 - i. Controllers shall communicate with each other via wireless mesh network.
 - j. Controller shall include non-volatile memory for retaining device settings during power outages.
 - k. Controller shall UL Listed to UL916 and Certified to CAN/CSA C22.2 NO 205-M1983.
 - l. Controller shall be FCC certified.

2.10 EMERGENCY LIGHTING INTERFACE

- A. Where emergency lighting is to be controlled by the lighting control system, provide UL924 listed load control relays as necessary to ensure that emergency lights are automatically turned full on upon loss of normal power to the area.

2.11 WEB BASED CENTRAL CONTROL SOFTWARE

- A. Web based Central Control Software: Central control software application is used to commission, configure and manage the system. Every system parameter in the building and associated exterior areas is configured for each individual user or space and baseline settings are established for each of the following (depending on the basis of design) system features:
 - 1. Daylight harvesting.
 - 2. Occupancy control.
 - 3. Smart time scheduling.
 - 4. Task tuning.

5. Personal control.
 6. Load shedding.
- B. Software utilizes a web-based interface that permits a user to easily navigate between zones, floors or different buildings and allows a user to zoom in or zoom out of specific areas of a building. Both 3-dimensional and two-dimensional multi-floor views shall be available. System features such as creation of zone hierarchies, overlapping and support zone definitions, user access rights, timeout settings for occupancy sensors, calibration of light levels for daylight harvesting and the configuration of multiple time schedule profiles shall be available. A web based Graphical User Interface (GUI) application integral to the system will be used to develop a dynamic, real-time, point-and-click graphic of each floor plan with representation of all light luminaire, wall stations, sensors, switches, etc. A central system server will be provided to support system data base and enterprise control management.
1. System Requirements:
 - a. Software must be able to run on a Windows operating system (Windows 10) and also on Apple Mac Intel PCs.
 - b. Must support all common browsers, i.e.,
 - 1) Internet Explorer
 - 2) Mozilla Firefox
 - 3) Safari
 - 4) Google Chrome
 - c. Must provide network connection/access to all network-enabled devices.
 - C. The GUI shall give the user the ability to temporarily override timeclock and zone parameters on a zone-by-zone basis for after-hours events.
 - D. All programming shall be provided by the lighting controls system manufacturer.

2.12 EMERGENCY MANAGEMENT SYSTEM (EMS) GATEWAY

- A. System shall provide a BACnet IP gateway as a downloadable software plug-in to its management software.
- B. System shall be capable of communicating and receiving input from the owner's EMS system.
- C. BACnet IP connection shall also be available utilizing JACE-600 hardware unit.
- D. BACnet IP hardware shall be capable of supporting up to 1500 total devices across up to 5 total Gateways.
- E. BACnet IP connection shall communicate information gathered by networked system to other energy management systems.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install lighting controls as required and where indicated, in accordance with manufacturer's written instructions and project shop drawings, applicable requirements of NEC, and recognized industry practices to ensure that products serve intended function.
- B. Sensor Design and Layout:
 1. It shall be the equipment manufacturers'/ contractors' responsibility to provide the quantity of sensors required for complete and proper coverage without gaps

- within the range of coverage of controlled areas. Rooms shall have 100% coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room. The locations and minimum quantities of sensors shown on the Drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The equipment manufacturer/contractor shall provide additional sensors if required to properly and completely cover the respective room. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.
2. Exact locations of control unit hardware boxes shall be based on observing good installation practice and shall be coordinated with other elements of the reflected ceiling plan. Control unit hardware shall be fully concealed.
- C. Box Condition: Install low voltage lighting control devices only in electrical boxes which are clean, free from excess building material, debris, and similar matter.
- D. Wiring:
1. All branch circuit wiring shall be installed in an approved raceway.
 2. Low voltage wiring shall be installed in an approved raceway where concealed in inaccessible locations or exposed. Where low voltage wiring is concealed in accessible ceiling plenums, it may, with pre-approval from the Owner and Engineer, be routed without a raceway using air plenum rated cable.
 3. All low voltage wiring shall be color coded and identified or tagged at terminals to assist with future maintenance.
- E. Sensor Testing and Adjustment: At the time each sensor is installed, it shall be adjusted as follows:
1. Sensitivity shall be adjusted for proper occupant detection appropriate to the usage of the room.
 2. Set time delay at approximately 6 minutes after setting in 30 second test to verify sensor/control unit operation.
 3. Check indicator light of each sensor to verify that occupancy is being detected in the range desired.
 4. Sensor operating frequencies shall be selected to select interference with other units in the vicinity as required.
 5. Ensure that there are no obstructions which could block proper sensor coverage, thereby minimizing the sensor detection zone.
 6. Occupancy sensors may be affected by various conditions in the room. It may be necessary for the Contractor to make adjustments, change the location or type of sensor to obtain proper operation in a specific room. The Contractor/equipment manufacturer shall have final responsibility for proper operation and coverage of the system in each room and should therefore make labor allowance for such changes and adjustments. The Contractor is also responsible for acquiring approval from Engineer for any changes or deviations from project specifications.

3.2 SPARES

- A. Provide 10% spare sensors and switch packs of each type used on the project.
- B. Deliver spares to the Owner at completion of project.

3.3 SYSTEM COMMISSIONING

- A. The contractor shall provide lighting system functional testing per C408.3.1 of the 2015 International Energy Conservation Code. A lighting control system manufacturer's representative shall be on site to assist the contractor during testing. Any deficiencies in the system's performance shall be corrected immediately prior to issuing a final report.
- B. All occupancy sensors shall be tested for location and functional acceptability.
- C. Time switch controls shall be tested for the correct time, date and owners control schedule. Lighting on time switch controls shall be tested for on / off / dimming status.
- D. Daylight responsive controls shall be tested for location and functional acceptability.
- E. All building management system software, graphics, reporting and remote control shall be tested and accepted by the Owner prior to issuing the functional testing final report.
- F. A final report certifying that the installed lighting controls meet documented performance criteria of section C405 of the 2015 International Energy Conservation Code shall be submitted to the Owner, Architect and Engineer for approval within 90 days from the date of receipt of the Certificate of Occupancy.

3.4 DEMONSTRATION/TRAINING

- A. Upon completion of testing and adjustment, the Contractor shall demonstrate operation of the system to representatives of the Owner and Engineer.
- B. The lighting controls manufacturer shall provide eight hours of in-person instruction for the owner's personnel in proper maintenance, adjustment, and operation of the lighting controls and graphical user interface. The training shall be recorded and turned over to the owner for future education and training.

3.5 Project Closeout Documentation

- A. Provide a factory published manual:
 - 1. Warranty
 - 2. Technical support contact
 - 3. Electronic manual

END OF SECTION

SECTION 28 3110

FIRE DETECTION AND ALARM - EXPANSION OF EXISTING SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF THE WORK

- A. Provide for the disconnection and removal of existing fire alarm devices and circuiting in existing building areas shown on the plans, and re-configuring of the existing fire alarm system in the Day Care portion of the building.
- B. The contractor shall reprogram the existing fire alarm system to include the new, renovated room names and room number.
- C. Sub-contracting of the fire alarm system or system components is not allowed. Responding proposer shall provide approved manufacturers certification with proposal.
- D. **Provide for the expansion of the existing Fire Alarm system in the Field House, as required for the renovation spaces within that building as shown on the plans. The existing Fire Alarm shall be expanded to include the required zone coverage for the added building zones included within this project. These buildings include;**
 - 1. **Midlothian ISD Stadium and Field House: –Addition and Renovations throughout the existing facilities. Confirm renovations areas with architects plans.**
 - a. Press Box existing Fire Alarm System:
 - 1) Silent Knight – IFP-50
 - b. Field House existing Fire Alarm System:
 - 1) Silent Knight – IFP-50
- E. Provide for the complete removal of the existing Fire Alarm system in areas indicated to have the existing system removed, where new fire alarm system is installed upon completion and final acceptance by the AHJ of the new Fire Alarm system, removal to include all existing cabling from the system to be removed, and all associated initiation, notification and ancillary devices, including power supplies, batteries, chargers and relay panels.
- F. Provide Surge Protection Devices (SPDs) / TVSS surge suppression as required by NFPA 72 for all underground circuits.
- G. Required system features:
 - 1. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system shall be supervised either electrically or by software-directed polling of field devices. The system shall also be listed by Underwriter's Laboratories under the category of Control Unit System (UOJZ) and Control Unit Accessories (UOXX).
 - 2. Multiplex communication conductors.
 - 3. Control of auxiliary devices, such as fan shut down, etc.
 - 4. Battery standby system – 24 hour.
 - 5. Remote station annunciator contacts.
 - 6. Microprocessor based monitoring and control system.
 - 7. Multiplex communication conductors. (Class A)
 - 8. Remote station annunciator, refer to drawings for location(s)

9. The system shall be 100% field programmable without the need for external computers or PROM programmers, and shall not require the replacement of memory IC's.
 10. Provide integrated dialer for outside monitoring of facility.
 11. Interface to Kitchen Hood Fire Extinguishing System.
 12. Interface to Fire Doors and associated release mechanisms.
 13. Door Hold Open devices and release mechanisms.
 14. Provide integrated UDAC for Outside Monitoring to transmit system status Monitoring Service.
- H. System shall consist of the following components or their functional equivalents:
1. Microprocessor based central processing unit.
 2. Remote Annunciator Panels. (quantity as indicated on plans)
 3. Annunciator.
 4. Automatic detecting devices.
 5. Manual devices.
 6. Alarm and warning devices.
- I. Fire alarm system shall be expandable by the addition of the required modules to the basic system.
- J. Each zone shall consist of not more than eight manual or automatic devices.
- K. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.
- L. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.
- M. At the time of Bidding, provide unit cost for owner directed changes for the following devices:
1. Smoke Detectors
 2. Audio / Visual Devices
 3. Visual Only Devices
 4. Duct Detectors
 5. Pull Stations
- N. Contractor to design and provide all equipment, accessories, and materials in accordance with the contract documents to provide a complete and operating system.
- O. Conduits, boxes and other raceways required for the Fire Alarm system should be provided by the Fire Alarm Contractor, as required for a compliant design, including any revisions following the approved drawings by the Fire Alarm Contractor.
- P. **System to be designed in accordance with all applicable codes including local ordinances, by an experienced and licensed Fire Alarm designer.**
- Q. Building is to be designed to the code minimum but also to include the additional devices / requirements stipulated within this specification. If additional devices indicated require additional design requirements to be code compliant, that is to be taken into account during bidding and designing in order to design and build a fully compliant system.
- R. Designer to bid and anticipate providing required devices for existing portable buildings.

- S. **Review and possible changes to design are subject to review by the local Fire Marshal (or authority having jurisdiction), up to Final Testing and Acceptance by AHJ.**
- T. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, analog addressable intelligent fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies and wiring as shown on the drawings and specified herein. The extent of fire alarm system work is shown on drawings and in schedules, and is hereby defined to include furnishing and installing of a system with the following sequence of operation:
1. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes fire alarm signaling devices, sounding a non-coded alarm, providing zone identification at the fire alarm control panel and annunciator panels.
- U. The Fire Alarm Installation Contractor shall be knowledgeable and experienced in work of a similar nature to determine the extent of the work required, and to prepare shop drawings illustrating the extent of the work to be undertaken, and to pursue the work of the Fire Alarm System installation. The contractor shall review the Architectural, Plumbing, Electrical, Mechanical and Fire Alarm Drawings to fully understand the scope of work. The contractor shall supervise, release, engage and/or monitor all devices required by Code or Local Authority whether specifically indicated on drawings or addressed in specifications. **The installing contractor is responsible for meeting all required local and national codes.**
- V. **Design Criteria – In addition to designing/providing the code required minimums, the following shall be incorporated into the design utilizing the requirements of the code regarding spacing, location, additional required coverage area, etc:**
1. Strobes – each room is to provide a minimum of 1 visual strobe. The location of audio notification Horn and Visual combo strobes to be determined by designer based on Db level requirement of the code.
 2. Heat Detectors - in addition to spaces required by code, provide at the following rooms: Electrical, mechanical.
 3. Provide 212deg F heads for the elevator machine room.
 4. Fire Alarm Control Panel location – reference plans for location and coordinate exact location with the Architect/Fire Marshal prior to installation.
 5. Kitchen – Heat detectors at a fixed temperature rating
 6. **Provide in writing any deviations from the above, both exclusion recommendations and additions, for review during submittal. Exclusions are to be reviewed and considered by the owner and design team, but not guaranteed. Possible additions required by code to accommodate the above guidelines are to be included in the base bid. Minimum standards above are to be included in the design base bid, exclusions to be considered with a credit value.**
- W. This section of the specification includes the final design, furnishing, installation, connection and testing of the microprocessor controlled, analog addressable intelligent fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies and wiring as specified herein. The extent of fire alarm system work required is defined to include furnishing and installing of a system with the following sequence of operation:

1. Either manual activation of a fire alarm station or activation of an automatic initiating device energizes fire alarm signaling devices, sounding a non-coded alarm, providing zone identification at the fire alarm control panel and annunciator panels.
 2. Services for Monitoring by Eagle Mountain-Saginaw ISD.
- X. The contractor shall be an authorized provider and installer of the specified equipment, and shall be knowledgeable and experienced in work of a similar nature to determine the extent of the work required, and to prepare shop drawings illustrating the extent of the work to be undertaken, and to pursue the work of the Fire Alarm System installation. The contractor shall review the Architectural, Plumbing, Electrical, Mechanical and Fire Alarm Drawings to fully understand the scope of work. The contractor shall supervise, release, engage and/or monitor all devices required by Code or Local Authority whether specifically indicated on drawings or addressed in specifications.
- Y. The contractor shall utilize all existing current campus building and room identification for programming of fire alarm zones. Devices shall be labeled with building names and either room names, numbers or both as directed by the owner.
- Z. Sub-contracting of the fire alarm system or system components is not allowed. Responding proposer shall provide approved manufacturers certification with proposal.
- AA. Provide for the design and installation of the fire alarm system, with suggested minimum device coverage as indicated. Additional devices may be required for NFPA approved coverage based on existing conditions not known at the time of issue.
- BB. **Fire Alarm contractor shall provide all duct smoke detectors as shown on mechanical plans, coordinate with mechanical contractor for installation on all units scheduled to be rated at over 2000cfm.**
1. Fire Alarm Contractor shall subcontract with a mechanical contractor for all required work related to air handler fan shut-down.
 2. Fire Alarm Contractor shall provide all duct detector devices, enclosures; the Fire Alarm Contractor's mechanical sub-contractor shall install the duct detectors on the existing systems, and provide fan shut down.
- CC. Provide TVSS surge suppression as required by NFPA 72 for all underground circuits.
- DD. Required system features:
1. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system shall be supervised either electrically or by software-directed polling of field devices. The system shall also be listed by Underwriters Laboratories under the category of Control Unit System (UOJZ) and Control Unit Accessories (UOXX).
 2. Multiplex communication conductors.
 3. Control of auxiliary devices, such as fan shut down, etc.
 4. Battery standby system – 24 hour.
 5. Remote station annunciator contacts.
 6. Microprocessor based monitoring and control system.
 7. Multiplex communication conductors. (Class A)
 8. Remote station annunciator, refer to drawings for location(s)
 9. The system shall be 100% field programmable without the need for external computers or PROM programmers, and shall not require the replacement of memory IC's.
 10. Provide integrated dialer for outside monitoring of facility.
 11. Interface to Kitchen Hood Fire Extinguishing System.

12. Interface to Fire Doors and associated release mechanisms.
 13. Door Hold Open devices and release mechanisms.
 14. **Provide integrated IP Fire Alarm Communicator, UL Listed for monitoring**
 15. Provide integrated UDAC for Outside Monitoring to transmit system status Monitoring Service, by local telephone lines.
- EE. System shall consist of the following components or their functional equivalents:
1. Microprocessor based central processing unit.
 2. Remote Annunciator Panels. (quantity as required by Local Authority Having Jurisdiction, and located with Owner's rep.)
 3. Annunciator.
 4. Automatic detecting devices.
 5. Manual devices.
 6. Alarm and warning devices.
- FF. Fire alarm system shall be expandable by the addition of the required modules to the basic system.
- GG. Each zone shall consist of not more than eight manual or automatic devices.
- HH. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.
- II. The system shall be an active/interrogative type system where each addressable device is repetitively scanned, causing a signal to be transmitted to the main fire alarm control panel (FACP) indicating that the device and its associated circuit wiring is functional. Loss of this signal at the main FACP shall result in a trouble indication as specified hereinafter for the particular input.
- JJ. An intelligent reporting, microprocessor controlled fire detection and emergency alarm communication system shall be installed in accordance with the specifications, and all applicable codes.
- KK. The system shall be designed such that each signaling line circuit (SLC) shall be limited to only 80% of its total capacity used during the initial installation.
- LL. The FACP and peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).
- MM. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.
- NN. Coordinate with District for availability, provision and set up of monitoring telephone lines.

1.2 PERFORMANCE

- A. Alarm and trouble signals shall be digitally encoded by listed electronic devices onto an NFPA Style 6 looped multiplex communication system.
- B. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto NFPA Style 6 Signaling Line Circuits.
- C. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).
- D. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y).
- E. Power for initiating devices and notification appliances must be from the main fire alarm control panel to which they are connected.

- F. A single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
- G. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
- H. Horn circuits and control equipment shall be arranged such that loss of any one (1) horn circuit will not cause the loss of any other horn circuit in the system.

1.3 SYSTEM OPERATION

- A. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - 1. The System Alarm LED shall flash.
 - 2. A local piezo-electric signal in the control panel shall sound.
 - 3. The 80-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - 4. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
 - 5. The audio portion of the system shall sound the proper signal to the appropriate zones.

1.4 QUALITY ASSURANCE

- A. Contractor must be a current, certified dealer/installer of the existing Fire Alarm system.
- B. The National Fire Protection Association publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Use current locally adopted editions of the standards.
 - 1. No. 72A Local Protective Signaling Systems.
 - 2. No. 72D Proprietary Protective Signaling Systems.
 - 3. No. 72E Automatic Fire Detectors.
 - 4. No. 90A Installation of air conditioning and ventilating systems.
 - 5. No. 101 Life Safety Code.
- C. The contractor furnishing and installing the equipment shall show satisfactory evidence with the shop drawings that they maintain stocks of replacement parts, and maintain a service department which is fully capable of maintaining the equipment.
- D. Fire alarm systems shall be installed by an agent having a current certificate of registration with the State Fire Marshal's Office of the Texas State Board of Insurance, in accordance with state law. A "Fire Alarm Installation Certificate" shall be provided as required by the Office of the State Fire Marshall.
- E. Warranty:
 - 1. The Contractor shall warrant his work against defective materials and workmanship for a period of one year from the date of acceptance of the entire project, unless specific longer term is specified with Individual System Specification.
 - 2. Neither Final Payment nor any provisions in Contract Documents shall relieve the Contractor of the responsibility for faulty materials or workmanship.

3. Contractor shall remedy any defects due thereto, and pay for any damage to other work resulting therefrom, which shall appear within a period of five years from the date of acceptance of the entire project (substantial completion).
4. The Owner shall give notice of observed defects with reasonable promptness.
5. This Guarantee shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

F. Project Record Documents:

1. The Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and uncovered existing utility piping outside the Building.
2. Upon submitting request for Final Payment, Contractor shall turn over to the Architect-Engineer, for subsequent transmittal to the Owner, clean, neatly marked set of reproducible plans showing "as installed" work.
3. In addition to the above, the Contractor shall accumulate during the Job's progress the following data, in multiple duplication (three each), prepared in 3-ring binders of sufficient size, black in color, neat in appearance and turned over to the Architect-Engineer for checking and subsequent delivery to the Owner:
 - a. All warranties, guarantees and manufacturer's direction on equipment and material covered by the Contract
 - b. Approved fixture/equipment brochures
 - c. Copies of approved Shop Drawings
 - d. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
 - e. Any and all data and/or plans required during construction.
 - f. Repair parts lists of all major items and equipment including name, address and telephone number of the local supplier or agent.
 - g. The first page or pages shall have the name, addresses and telephone numbers of the following; General Contractor and all sub-contractors, Major Equipment Suppliers.

G. Training:

1. Upon completion of the work and at a time designated by the Owner's representative, provide a formal training session for the Owner's operating personnel to include location, operation and maintenance of all the mechanical, electrical and plumbing equipment and systems.
2. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that will be covered. Submit the outline for review by the Owner's representative one week prior to training session.
3. At the conclusion of the instruction, obtain signatures of the attendees on each copy of the outline to signify that they have proper understanding of the operation and maintenance of the systems. Submit the signed outlines to the Owner's representative and Engineer as a condition of final acceptance.

H. Plans and Specifications:

1. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures and equipment and the method of connecting and controlling them. It is not intended to show every connection in detail and all fittings required for a complete system.
2. The Systems shall include, but are not limited to, the items shown on the plans.
3. Exact locations of these items shall be determined by reference to the general plans and measurements of the Building and in cooperation with other

Contractors, and in all instances, shall be subject to the approval of the Architect-Engineer.

4. The Architect-Engineer reserves the right to make any reasonable change in the location of any part this work without additional cost to the Owner.

I. Utilities, Locations and Elevations:

1. Locations and elevations of the various utilities within this scope of work have been obtained from the City, Owner and/or other substantially reliable sources and are offered separately from the Contract Documents, as a general guide only, without any guarantees as to the accuracy.
2. **The Contractor shall examine the site, shall verify to his own satisfaction the locations, elevations and the availability / characteristics (voltage/phase/pressure/capacity) of all utilities and services required, and shall adequately inform himself as to their relation to the work; the submission of bids or proposals shall be deemed evidence thereof.**
3. The Contractor shall coordinate all services with the respective Utility Company or Agency during construction; coordinate changes made by Utility Companies or Agencies to the design of the project, and coordinate with the Owner, Architect-Engineer, and Utility the scheduling of any shutdowns or delays that may occur in providing service.
4. The Contractor shall verify location / depth / direction of flow, conduct all necessary tests, inspections, coordinate with Owner's representatives and Utilities, and check for existing underground utilities before ditching / trenching / drilling.
5. The Contractor shall be responsible for repair of any cut of damaged lines or utilities he uncovers and disrupts. There are lines and utilities that may not be shown on the plans.

1.5 SUBMITTALS

A. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout and main control panel module layout, configurations and terminations.

B. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment and system.
4. Approvals will be based on complete submissions of manuals together with shop drawings.

C. Software Modifications

1. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system

operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

D. Certifications:

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.
- B. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.
- C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
- D. The main fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.2 MAIN FIRE ALARM CONTROL PANEL AND FIRE COMMAND CENTER:

- A. Provide fire alarm system products in sizes and capacities indicated, complying with manufacturer's published product information on standard materials and components designed and constructed for applications indicated.
- B. Provide required basic wiring materials as specified in Division 26 sections. Comply with manufacturer's instructions and recommendations.
- C. Speakers: Provide manufacturer's standard construction fire alarm speaker, System Sensor Spectr- Alert Advance. UL listed to Standard 1971 and shall meet the following criteria:
 1. Ceiling Mount:
 - a. Indoor - System Sensor SPCW(V) Dual voltage (25/70.7 Vrms) with high volume dB sound output where required for coverage.
 2. Wall Mount Mount:

- a. Indoor - System Sensor SPW(V) Dual voltage (25/70.7 Vrms) with high volume dB sound output where required.
 - b. Outdoor- System Sensor SPW(K) Dual voltage (25/70.7 Vrms) with high volume dB sound output where required for coverage.
- D. Speaker Strobes: Provide manufacturer's standard construction fire alarm speaker / strobe, System Sensor Spectr- Alert Advance. UL listed to Standard 1971. . Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
 - 1. Ceiling Mount:
 - a. Indoor - System Sensor Advance Speaker Strobe SPCR Dual voltage (25/70.7 Vrms) with high volume dB sound output, and candela setting as required for coverage.
 - 2. Wall Mount Mount:
 - a. Indoor - System Sensor SPSR Dual voltage (25/70.7 Vrms) with high volume dB sound output, and candela setting as required for coverage.
 - b. Outdoor - System Sensor SPSRK Dual voltage (25/70.7 Vrms) with high volume dB sound output, and candela setting as required for coverage.
- E. Visual Devices: Provide manufacturer's standard construction fire alarm strobe, Silent Knight 5865 Series with flashing xenon light visual signal. UL listed to Standard 1971. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
 - 1. The maximum pulse duration shall be 2/10 of one second.
 - 2. Strobe intensity shall meet the requirements of UL 1971.
 - 3. The flash rate shall meet the requirements of UL 1971.
- F. Addressable Devices – General
 - 1. Addressable devices shall provide an address-setting means using rotary decimal switches.
 - 2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address or special tools for setting the device address, such as a dip switch are not an allowable substitute.
 - 3. Detectors shall be analog and addressable, and shall connect to the fire alarm control panel's Signaling Line Circuits.
 - 4. Addressable smoke and thermal detectors shall provide dual (2) status LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs can be programmed off via the fire control panel program.
 - 5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity can be automatically adjusted by the panel on a time-of-day basis.
 - 6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
 - 7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature.
 - 8. The following bases and auxiliary functions shall be available:

- a. Sounder base rated at 85 DBA minimum.
 - b. Form-C Relay base rated 30VDC, 2.0A.
 - c. Isolator base.
- 9. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
- 10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).
- G. Addressable Pull Box (Pullstation): Provide manufacturer's standard construction, red enclosure, manual fire alarm stations, double action semi flush mounting, Silent Knight SD500-PS, Addressable.
 - 1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 - 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 - 3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75" or larger. Provide "Stopper II" with local audible alarm at each pullstation location. Provide "Weather Stopper II" with local audible alarm at exterior locations. (Verify with Each Authority Having Jurisdiction on acceptance of audible alarm on pull station covers.) Where allowed by Local Authority. Provide without audible alarm where audible alarm is not allowed.
- H. Intelligent Photoelectric Smoke Detector: Provide manufacturer's standard construction automatic photoelectric type smoke detector, Silent Knight SD505-APS.
 - 1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- I. Intelligent Thermal Detectors (Heat Detector)
 - 1. Thermal detectors shall be intelligent addressable devices rated at 135°F and have a rate-of-rise element rated at 15° F per minute. It shall connect via 2 wires to the fire alarm control panel signaling line circuit, Silent Knight SD505-AHS.
- J. Door Holders and Closers:
 - 1. Door holders, flush mounted standard hardware depth. Silent Knight FM998-120 or equal. Refer to electrical drawings for additional information and mounting locations.
- K. Intelligent Duct Smoke Detector: (Duct Detector) Provide manufacturer's standard construction automatic smoke detectors, duct type, with sampling tubes, Silent Knight SD505-ADHR/DTS or equal, with auxiliary contacts for fan shut down as required. (Provided and installed by Fire Alarm Contractor, Addressable Device.)
 - 1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

L. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops. Silent Knight SD500-AIM or SD500-MIM.
2. The monitor module shall mount in a 4" square, 2" deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2" x 1-3" x 2". This version need not include Style D or an LED.

M. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. Silent Knight Sd500-ANM.
2. The control module shall mount in a standard 4" square, 2" deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (FormC) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

N. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building. Silent Knight SD500-LIM.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4" deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

O. Cable

1. **All cable shall be color red.**

2.3 BATTERIES AND EXTERNAL CHARGER:

A. Battery:

1. Shall be 12 volt, Gell-Cell type.
2. Battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 5 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free.
4. Final battery size to be calculated & confirmed by system installer based on actual system loads.
5. External, physical dimension shall allow for placement within system enclosure.

B. External Battery Charger:

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120-volt 60 hertz source.
2. Shall be rated for fully charging a completely discharged battery within 60 hours while simultaneously supplying any loads connected to the battery.
3. Shall have protection to prevent discharge through the charger.
4. Shall have protection for overloads and short circuits on both AC and DC sides.
5. Final battery charger characteristics to be calculated & confirmed by system installer based on actual system loads.

C. Microprocessor based monitoring and control system.

1. The monitoring and control system shall consist of a central processing unit, (CPU), Display Interface Assembly DIA, Remote Annunciator Panels. The system shall be of modular construction, with components connected together using multiplex wiring techniques to provide Fire Detection and Evacuation signals. System shall be Silent Knight IFP-1000 ESC Intelligent, Addressable, and Analog Multiplex Life Alarm or approved equal. CPU shall be surface or flush wall mounted control units where shown. Unit shall have all necessary components to completely supervise and operate the system. Power wiring shall be for single phase operation. Unit shall include the following functional equivalents, as required:
 - a. Zone modules.
 - b. Power supplies.
 - c. Emergency battery for 60 hour backup.
 - d. Battery charging circuit.
 - e. Auxiliary relays.
 - f. Common module.
 - g. Controls: System reset, acknowledge, lamp test, trouble, silence.
 - h. Indicators: Common alarm, common trouble, AC power failure, low battery, and power on.
 - i. Other equipment and components as required for system operation.
2. System shall provide LCD annunciation to indicate system monitor point status, and toggle switches to allow operation of the system control points. Unit shall function as a zone annunciator and control center to initiate alarm or building evacuation function. Control center and Remote Annunciator shall be wall mounted, located as shown, with battery backup, self-contained power supply

supplied by 120 volt emergency power if available or by dedicated 120 volt normal power circuit.

- D. Provide fire alarm system products in sizes and capacities indicated, complying with manufacturer's published product information on standard materials and components designed and constructed for applications indicated.
- E. Provide required basic wiring materials as specified in Division 26 sections. Comply with manufacturer's instructions and recommendations.
- F. Tamper switches and water flow alarms, when furnished with sprinkler system, shall be connected to Fire Alarm System.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install system and materials in accordance with manufacturer's instructions and roughing in drawings, and details on the drawings. Install electrical work and use electrical products complying with requirements of applicable Division 16 sections of these specifications.
- B. The term "wiring" is defined to include the providing of wire, conduit and miscellaneous materials as required for mounting and connecting the electrical devices. All wiring and devices shall be fully concealed unless otherwise approved by Engineer.
- C. Install a complete wiring system as required by the local authority for fire alarm system. Conductor shall be two twisted pair fire alarm cable in a separate conduit system. Provide multi-conductor instrument harness bundle in place of single conductors where a number of conductors can be run along a common path. Fasten flexible conductors bridging cabinets and doors neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.
- D. Install a flashing light and horn where required by the Local Authority Having Jurisdiction.
- E. Manual stations are to be set 48" above finished floor. Alarm devices are to be set at 80" aff maximum. Alarm devices in Activity rooms, Gymnasiums and other similar use areas shall be suitably protected with substantial wire guards, not less than 11 gauge, and 1" x 2" mesh.
- F. Number code or color code conductors, appropriately and permanently for identification and servicing of system.
- G. Provide and install new duct detectors in existing air handling equipment. Fire Alarm contractor will need to provide a mechanical contractor for final tie-in and set-up.

3.2 CONNECTIONS

- A. The Contractor shall make provisions for and shall connect initiating devices to the Fire Alarm System which may be furnished under other sections of these specifications, whether specifically indicated on the Electrical Series drawings or not. This Contractor shall furnish wiring, make final connections to auxiliary devices furnished under other sections of the specifications, and provide interface devices such as relays where required, some of these components may be existing in existing buildings:
 - 1. Door Hold Open devices.
 - 2. Fire Door release devices.
 - 3. Duct detectors.
 - 4. Kitchen hood fire extinguishing equipment.

- 5. **Other dry or wet sprinkler system initiating devices.**
- 6. **Dry Contacts for and connection to District's Monitoring Interface.**

- B. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- C. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- D. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.3 TYPICAL OPERATION:

- A. Actuation of any manual station, smoke detector, heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:
 - 1. Activate all programmed horn circuits.
 - 2. Actuate strobe units until the panel is reset.
 - 3. Light the associated indicators corresponding to active horn circuits.
 - 4. Release all magnetic door holders, Stage Draft doors and Fire doors to adjacent zones on the floor from which the alarm was initiated.
 - 5. Return all elevators to the primary or alternate floor of egress.
 - 6. A smoke detector in any elevator lobby shall, in addition to the above functions, return all elevators to the primary or alternate floor of egress.
 - 7. Smoke detectors in the elevator machine room or top of hoistway shall return all elevators in to the primary or alternate floor. Smoke detectors or heat detectors installed to shut down elevator power shall do so in accordance with ANSI A17.1 requirements and be coordinated with the electrical contractor.
 - 8. Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as appropriate.
 - 9. Activation of any sprinkler system low pressure switch, on valve tamper switch, shall cause a system supervisory alarm indication.

3.4 TEST:

- A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.
 - 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 - 3. Verify activation of all flow switches.
 - 4. Open initiating device circuits and verify that the trouble signal actuates.
 - 5. Open signaling line circuits and verify that the trouble signal actuates.
 - 6. Open and short notification appliance circuits and verify that trouble signal actuates.
 - 7. Ground initiating device circuits and verify response of trouble signals.
 - 8. Ground signaling line circuits and verify response of trouble signals.
 - 9. Ground notification appliance circuits and verify response of trouble signals.

- 10. Check installation, supervision, and operation of all intelligent smoke detectors using walk test.
 - 11. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- B. The entire fire alarm system shall be tested in accordance with NFPA standards and other applicable standards. Results of such testing shall be recorded on forms approved for the purpose, certified and submitted to the Owner's representative with final documents.
- 3.5 FINAL INSPECTION:
- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the complete, expanded is function properly in every respect.
- 3.6 INSTRUCTION:
- A. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."
- 3.7 ZONES
- A. Zones shall be identified and scheduled on the Shop Drawing Submittal using current building designations, room names and numbers.

END OF SECTION

SECTION 31 0000

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Excavating, filling, backfilling, grading, and compacting of earth at the site.
 - 2. Preparation of building pad to limits shown on plans.
 - 3. Provide and stockpile topsoil on site.
 - 4. Dewatering excavations.
- B. Related Sections:
 - 1. Section 01 45 23 - Testing and Inspection Services
 - 2. Section 31 10 00 - Site Clearing

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM D 698-78 Tests Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Hammer and 12-in. Drop.
 - 2. ANSI/ASTM D2922 - Density of Soil in Place by the Nuclear Methods.

1.04 SUBMITTALS

- A. Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: Submit a one gallon sample and material analysis results of imported topsoil from a testing laboratory indicating compliance with these specifications. Any topsoil delivered to the site which does not comply with the approved sample shall be re-tested at the Contractor's expense and replaced.
- C. Test Reports:
 - 1. Submit copies of test reports in accordance with SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.
 - 2. Compaction Tests: Submit copies of compaction test reports.

1.05 QUALITY ASSURANCE

- A. Laboratory Control: On site or Imported topsoil, if required, shall be inspected and tested by an independent testing laboratory.
 - 1. Testing laboratory shall make tests of the soil from the selected source to determine that it meets the specified requirements for select fill and imported topsoil.

1.06 PROJECT CONDITIONS

- A. Temporary Sheet piling: Shore and sheet excavations to protect utilities and to prevent cave-in. Maintain sheet piling secure until permanent construction is in place. Remove sheet piling as excavations are backfilled.
- B. Drainage: Provide for adequate surface drainage during construction to keep the site free of surface water without creating a nuisance in adjacent areas.

- C. Pumping: Keep the excavations free of water at all times by pumping or other means. This shall be the responsibility of the Contractor regardless of the cause, source, or nature of the water.
- D. Protection:
 - 1. Property: Protect adjoining property, including improvements out-side the limits of the work. Protect walks, curbs, and paving from damage by heavy equipment and trucks.
 - 2. Protect benchmarks.
 - 3. Protect above and below grade utilities which are to remain.
 - 4. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation. Monitor shoring system and surrounding ground surface during construction to detect movement. If movement becomes significant, take contingency steps to brace excavation and adjacent utility lines.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Topsoil
 - 1. Strip topsoil from limits of grading areas, clean of grass, roots, rock and debris to a depth of 6", and stockpile for placement (6" minimum) on all landscape and "open space" areas. Contractor shall investigate the site to his satisfaction to determine if suitable material is available on site to meet the specification for topsoil.
 - 2. Refer to landscape architect plans and specifications for additional topsoil requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Establish extent of excavation by area and elevation; designate and identify datum elevation.
- B. Set required lines and grades using a licensed surveyor.
- C. Maintain bench marks, monuments and other reference points.

3.02 PREPARATION

- A. Before starting excavation, establish location and extent of underground utilities occurring in work area.
- B. Notify utility companies sufficiently in advance to remove and relocate lines which are in way of excavation.
- C. Maintain, reroute or extend as required, existing utility lines to remain which pass through work area.
- D. Protect and support utility services uncovered by excavation.
- E. Remove abandoned utility service lines from areas of excavation; cap, plug or seal such lines and identify at grade.
- F. Accurately locate and record abandoned and active utility lines rerouted or extended on Project Record Documents.

- G. Upon discovery of unknown utility or concealed condition, discontinue affected work and notify Architect.
- H. Remove grass, weeds, roots and other vegetation from areas to be excavated, filled and graded. Fill stump holes and like small excavations with suitable material placed in lifts and thoroughly tamped.
- I. Scarify the subgrade soil of pavement areas to a minimum depth of 6 inches, water and recompact. Compact to 95-100% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content of 0 to 5% of optimum moisture content. Reference the Geotech Report.
- J. Scarify general subgrade soils in place to a depth of 6 inches and recompact. Compact to at least 95-100% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content of 0 to 5% of optimum moisture content. Reference the Geotech Report.

3.03 EXCAVATION

- A. General: Excavate to the lines, grades and sections shown on the drawings. Allow space for the construction of forms. **All excavation shall be unclassified as required regardless of the condition or type of material encountered, including rock.**
 - 1. Cut areas accurately to the indicated cross-sections and grades. Take care to prevent excavation below the grades indicated. Any bottoms and slopes that are undercut shall be backfilled with earth fill and compacted.
 - 2. Finish the excavating required for graded areas and building pad to a tolerance of one inch above or below the rough grade.
 - 3. Remove underground obstructions except for piping and conduit which shall be handled as specified in SECTION 01 11 00 - SUMMARY OF WORK.
- B. Over cut planting and lawn areas to allow a layer of topsoil not less than 6" thick.
- C. Maintain excavations to drain and be free of excess water. Ponding of water on site will not be permitted.
- D. Exercise extreme care in grading around existing trees. Do not disturb existing grades around existing trees except as otherwise noted. When excavation through roots is necessary, and after review by Landscape Architect, perform by hand and cut roots with sharp axe, prune trees to compensate for root loss.
- E. Fill over-excavated areas under structure bearing surfaces in accordance with Architect's direction.
- F. Do not allow construction equipment to create "pumping" of soils.
- G. Stockpile excavated clean fill for reuse where directed. Remove excess or unsuitable excavated fill from site.
- H. Over excavate existing soils in saturated conditions. Stockpile wet material. Allow drying out to take place. Mix stockpiled materials with relatively dry onsite material before recompacting.

3.04 WASTING

- A. Surplus excavated material not suitable or required for embankment fill and backfill shall be wasted off site.

3.05 FILL AND BACKFILL

- A. Filling: Construct compacted fills to the lines, grades and sections shown on the drawings.
 - 1. Complete stripping and wasting operations in advance of fill construction. Proof roll, compact, and establish moisture content.

2. Deposit and mix fill material in horizontal layers not more than 8" deep, loose measurement. Manipulate each layer until the material is uniformly mixed and pulverized.
 3. Fill material shall have moisture content to at least two percentage points above (+2%) its optimum moisture content and compacted to at least 95% Standard Proctor (ASTM D698), to achieve specified compaction. If fill is too wet, dry by aeration to achieve desired moisture content. If fill is too dry, add water and mix in by blading and discing to achieve desired moisture content.
 4. Exercise care to prevent movement or breakage of walls, trenches, and pipe during filling and compaction. Place fill near such items by means of light equipment and tamp with pneumatic or hand tampers.
 5. Proof roll exposed subgrade in building and paving areas with heavily loaded dump truck (25 ton minimum) or similar acceptable construction equipment, to detect unsuitable soil conditions. Commence proof rolling operations after a suitable period of dry weather to avoid degrading acceptable subgrade surfaces. Make four passes over each section with proof rolling equipment, with the last two perpendicular to the first two.
 5. Cut out soft areas of subgrade not readily capable of in- situ compaction. Backfill and compact to density equal to requirements for subsequent backfill material.
- B. Backfilling: Construct compacted fill against and around concrete beams below finish grade.
1. Verify areas to be backfilled are free of debris, snow, ice or water, and ground surfaces are not frozen.
 2. Do not backfill until underground construction has been inspected, tested and approved, forms removed, and the excavations cleaned of trash and debris.
 2. Bring backfill to required grades by depositing material in horizontal layers not more than 10" deep, loose measurement.
 4. Site backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces.
 5. Maintain optimum moisture content of backfill materials to attain required compaction density.
 6. Make gradual changes in grade. Blend slopes into level areas.

3.06 COMPACTION

- A. Compact each layer of earth fill and backfill to the compaction and density specified.
1. Scarify the subgrade soil of pavement areas to a minimum depth of 6 inches, water and recompact. Compact to 95-100% Standard Proctor in accordance with ASTM D698 (Standard Proctor), moisture content of 0 to 5% of optimum moisture content. Scarify general subgrade soils in place to a depth of 6 inches and recompact. Compact to 95-100% Standard Proctor in accordance with ASTM D698 (Standard Proctor), at a moisture content of 0 to 5% of optimum moisture content. Compact non-granular or sand-like material to at least 95 percent of Standard Proctor within 2 percentage points below to 1 percentage points above of optimum.
 2. Equipment for compacting shall be sheeps foot and rubber tired rollers or other compactors capable of obtaining the required density. Compact the fill with power tampers and by hand in areas not accessible to rollers.
 3. Compact each layer of fill to the density listed below as a function of the location. The required density in each case is indicated as a percentage of the maximum dry unit weight determined using the standard compaction test ASTM D 698.
 - a. Material under paving-----95-100%
 - b. Material under lawn areas-----95-100%
 - c. Material under building-----Per Geotechnical Report and Building Subgrade Preparation

3.07 GRADING

- A. Site Grading: Shape and finish earthwork to bring the site to the finish grades and elevations shown on the drawings.
1. Establish grades by means of grade stakes placed at corners of units, at abrupt changes of grade, and elsewhere as may be required.

2. Rough grade for paving, and site improvements to the subgrade elevations required. Soft and unstable material which will not readily compact when rolled or tamped shall be removed and the resulting depressions filled with stable material and re-compacted.
 3. Finish grade to the finish contours and spot grades shown. Extend cuts and fills to feather out beyond the last finish contour or spot grade shown. Grade to uniform levels and slopes between points for which elevations are given, round off abrupt changes in elevation, and finish off smoothly. Finish grades shall slope away from the building in all directions to assure proper drainage.
 4. Execute erosion control measures in accordance with the Erosion Control Plan.
- B. Grading Around Trees: Where grading is required within the branch spread of trees that are to remain, perform the work as follows:
1. When trenching occurs, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by hand digging.
 2. When the existing grade at a tree is below the new finished grade, and fill not exceeding 6" is required, clean washed gravel graded from 1" to 2" size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18" and finish approximately 2" above the finished grade at the tree. Install gravel before earth fill is placed.
 3. Trees in areas where the new finished grade is to be lowered shall have re-grading work done by hand to elevation as indicated. Existing grades immediately surrounding the trunk shall not be altered except at the direction of the Architect.

3.08 PROTECTION, CLEAN-UP AND EXCESS MATERIALS

- A. Protect grades from construction and weather damage, washing, erosion and rutting, and repair such damage that occurs.
- B. Correct any settlement below established grades to prevent ponding of water.
- C. At locations where concrete or other foreign matter has penetrated or been mixed with earth, remove damaged earth and replace with clean material.
- D. Remove excess stockpiled material, debris, waste, and other material from site and leave work in clean finished condition for final acceptance. Contractor is responsible for disposal of debris and excess materials.

3.09 FIELD QUALITY CONTROL

- A. Compaction Tests: Field density testing of the select fill material under the building pad and paving shall be performed by an Independent Testing Laboratory.
1. Testing laboratory shall make one in place density test for each 5000 sq. ft. of area per lift in general site areas, but in no case less than two tests to ensure that the specified density is obtained. For tennis courts, ball fields, track, practice fields and competition field, the testing laboratory shall make one in place density test for each 3000 sq. ft. of area per lift, but in no case less than three tests to ensure that the specified density is obtained.
 2. The cost of the full-time inspection service shall be per Specification SECTION 01 45 23 - TESTING AND INSPECTION SERVICES.

3.10 CONSTRUCTION STAKING

- A. All drives must be staked using the profiles provided in the plans in addition to the grading and dimensional control plans. The contractor shall stake all vertical curves and points of grade break in order to achieve a smooth and uniform grade throughout. Verify all grades and elevations to confirm that ADA parking spaces, walks and ramps are per plans.

END OF SECTION

SECTION 31 1000

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supply General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Section Includes: Clearing the site of vegetation, site improvements and obstructions to make way for new work.
- B. Related Sections
 - 1. Section 31 00 00 - Earthwork.

1.03 PROJECT CONDITIONS

- A. Existing Conditions: Site is generally vacant, covered with some trees and native vegetation. Contractor shall visit the site and verify the nature and extent of clearing work required. There is also an existing stadium on the existing site.
- B. Protection: Contractor shall be responsible for the protection of adjoining property and improvements outside the limits of the work. Protect paving and utilities from damage by equipment and trucks.
- C. It shall be the responsibility of the Contractor to obtain a temporary water meter and temporary sanitary sewer facilities for use during construction.
- D. Contractor shall exercise care during operations to confine dust to the immediate work area and shall employ dust control measures to ensure adequate dust control throughout demolition and construction operations.

1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable building code for disposal of debris.
- B. Coordinate clearing Work with previous owner and utility companies.
- C. Conform to applicable portions of OSHA, including 1926.604.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that existing plant life and features designated to remain are tagged or identified

- B. Locate and identify all paving and utilities intended to remain. Contractor shall field verify and coordinate with Owner and respective facility owner the location and depth of existing active facilities/ utility lines within the construction limits and shall protect all such facilities from damage during construction operations. Damage to existing facilities to remain shall be repaired at the Contractor's expense for re-establishing the facilities to their pre-damaged condition.

3.02 PERFORMANCE

- A. Clearing:
 - 1. Remove trees, shrubs and other vegetation from within the area of the site where new construction is to be placed. Grub out roots to a depth of at least 18 inches below natural grade
 - 2. Dig out and remove buried obstructions to a depth of 24 inches below natural grade or 24 inches below the intended excavation elevation, whichever is lower. (Refer to landscape architect's plans and specifications)
 - 3. Remove existing trash, debris and abandoned facilities, which are to be removed from the site.
 - 4. Refer to SECTION 01 11 00 - SUMMARY OF WORK for handling of piping and conduit encountered below grade.
 - 5. Clear undergrowth and deadwood, without disturbing subsoil.
 - 6. Burning debris on site is not permitted.
 - 7. Remove debris, rock, fences, and extracted plant life from site.
- B. Reference landscape plans and specifications for limits for tree removal and pruning/trimming limits.
- C. Disposal:
 - 1. Clean up and remove from the site the stumps, logs, broken paving, rubble and debris resulting from the clearing and grubbing operations.
 - 2. Remove all traces of demolished items from the site work area and rough grade all areas that have been disturbed.
 - 3. Material to be wasted shall be legally disposed of off site, at no additional cost to Owner.
 - 4. Burning of combustible materials on the site will not be permitted.

3.03 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or regraded.
- B. Stockpile in a preapproved area on or near the site. Install erosion control around perimeter of stockpile.
- C. Reference landscape architectural plans and specifications for additional top soil requirements.

END OF SECTION

SECTION 31 2333

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Work Included:
 - 1. Excavation for piped utility material.
 - 2. Provide necessary sheeting, shoring, and bracing.
 - 3. Comply with Federal, State, and local trench safety requirements.
 - 4. Prepare trench bottom with appropriate materials.
 - 5. Dewater excavation as required.
 - 6. Place and compact granular beds, as required, and backfill.
- B. Related Work Specified in Other Sections
 - 1. Section 31 10 00 – Site Clearing
 - 2. Section 31 00 00 – Earthwork
 - 3. Section 33 30 00 – Sanitary Sewerage Utilities
 - 4. Section 33 40 00 – Storm Drainage Utilities

1.03 PRECAUTIONS

- A. Contractor shall determine the exact location of all utilities prior to construction.
- B. Notify all utility companies when necessary to disturb existing facilities and abide by their requirements for repairing and replacing.
- C. Protect all vegetation and other features to remain.
- D. Protect all benchmarks and survey points.

1.04 COORDINATION

- A. Where the specifications conflict with the City Water and Sewer Specification and City Standard Details for water and sewer construction, the Details and Specifications shall govern in that order.

PART 2 - PRODUCTS

2.01 BEDDING AND BACKFILL MATERIALS (ASTM D2487)

- A. Reference Sitework Details and City Standard Specifications. Reference site drainage plan and NCTCOG Specification for storm drainage.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Install barriers and other devices to protect areas adjacent to construction and to provide for public safety.

- B. Protect and maintain all bench marks and other survey points.

3.02 EXCAVATION TRENCHES

- A. Perform in such a manner as to form a suitable trench in which to place the pipe and so as to cause the least inconvenience to the public.
- B. Maximum width at the crown of the pipe shall be sixteen (16") inches plus the bell diameter of the pipe, unless approved specifically by the engineer due to unusual bracing and shoring requirements. The minimum width at the crown at the pipe shall be one foot plus the pipe bell diameter.
- C. Cut pavement along neat straight lines with either a pavement breaker or pavement saw.
- D. Trench Depth: For water lines - sufficient to provide minimum cover of 42 inches over the top of the pipe; for sewer lines and storm drain lines - as shown on the plans or as specified.
- E. Align trench as shown on the plans unless a change is necessary to miss an unforeseen obstruction. Should such a change be necessary, the as-built information shall be provided to the engineer and it shall be approved by the engineer.
- F. For water pipe, the trench shall be cut six (6") inches below the bottom of the pipe. The pipe shall be embedded in six (6") inches of granular material all around.
- G. For sewer pipe, excavate six (6") inches below the bottom of pipe and fill the bottom of the trench with crushed stone or as specified by the City Standard Water & Sewer Specifications.
- H. Trenches for storm drainage pipe shall be excavated and backfilled as shown on the plans.
- I. When unsuitable soil is encountered at the trench bottom, remove it to a depth required to assure support of the pipeline and backfill to the proper grade with coarse aggregate AASHTO M-43, Size No. 2 or 3.
- J. Remove rock encountered in trench excavation to a depth of six (6") inches below the bottom of the pipe barrel, backfill with an approved material, and compact to uniformly support the pipe. In no cases shall solid rock exist within six (6") inches of the finished pipeline.
- K. When rock borings or soundings are provided, they are for information only and do not guarantee existing conditions. Make such investigations as deemed necessary to determine existing conditions. All trench excavation shall be considered "unclassified excavation", with no additional compensation.

3.03 SHEETING, SHORING AND BRACING

- A. All trench excavation shall be in accordance with OSHA Regulations and Texas State law.

3.04 USE OF EXPLOSIVES

- A. The use of explosives on this project is strictly prohibited.

3.05 DISPOSAL OF EXCAVATED MATERIAL

- A. All excess excavated material that cannot be used, or is not suitable, shall be disposed of in a manner acceptable to the Architect, at no additional cost to owner.

3.06 UNAUTHORIZED EXCAVATION

- A. No excavation outside or below the proposed lines and grades shown on the plans shall be provided unless approved by the Architect / Engineer.

- B. Backfill areas of unauthorized excavation with the type material necessary (earth, rock or concrete) to insure the stability of the structure or construction involved.

3.07 REMOVAL OF WATER

- A. Keep excavated areas free of water while work is in progress.
- B. Take particular precautions to prevent the displacement of structures or pipelines as a result of accumulated water.
- C. Discharge from dewatering activities shall not be made to any sanitary sewer system unless approved by the system operator.

3.08 OBSTRUCTIONS

- A. Obstructions shown on the plans are for information only and do not guarantee their exact locations nor that other obstructions are not present. The contractor shall determine and verify the exact location of all obstructions and utilities prior to construction.
- B. When utilities or obstructions are not shown on the plans but are present off the roadway at the location of the proposed pipeline route, the contractor may request to relocate the pipeline at no additional cost to the Owner in the roadway if necessary to avoid disturbing the utility or obstructions.
- C. Exercise due care in excavating adjacent to existing obstructions and do not disturb same.
- D. In the event obstructions are disturbed, repair or replace as quickly as possible to the condition existing prior to their disturbance. The repair or replacement shall be at no cost to the Owner.
- E. If desired by the utility company, pay for the repair or replacement work performed by the forces of the utility company or other appropriate party.
- F. If replacement or repair of disturbed obstructions is not performed after a reasonable period of time, the Owner may have the necessary work done and deduct the cost of same from payments to the contractor.

3.09 STORM SEWER BEDDING

- A. Bedding for RCB/RCP/HDPE storm sewers shall be as specified in Section 501.6, 501.23, 504 and 508 of Standard Specifications for Public Works Construction, NCTCOG and site details.

3.10 GRAVITY SANITARY SEWER BEDDING

- A. Always maintain proper grade and alignment during the bedding and tamping process.
 - 1. Any pipe dislodged during this process shall be replaced by the contractor at his expense.
 - 2. Dig bell holes to assure uniform support of the pipe.
 - 3. All bedding shall be tamped to a minimum of 95% maximum dry density.
- B. Bedding for PVC Sewers:
 - 1. Refer to Sitework Details and Standard Water and Sewer Specifications.
 - 2. Lay sewer line on six inch (6") bed of crushed stone. Place granular material to a point twelve inches (12") above top of pipe.

3.11 BEDDING FOR WATER LINES

- A. The water line shall be bedded on six (6") inches of granular material in accordance with City Water and Sewer Specifications. Compact granular material to a point six inches (6") above the top of pipe.

- B. Dig bell holes to assure uniform support throughout the entire length of pipe.

3.12 INITIAL BACKFILLING

- A. Do not begin backfilling before checking/inspecting the grade and alignment of the pipe, the bedding of the pipe, and the joints between the pipe. If backfill material is placed over the pipe before an inspection is made, reopen the trench in order for an inspection to be made.
- B. Perform backfilling by hand, together with tamping, until fill has progressed to the top of specified embedment above the pipe.
 - 1. Deposit appropriate material free from lumps, clods, frozen material or stones in layers approximately eight (8") inches thick.
 - 2. Compact by hand, or with manually operated machine tampers actuated by compressed air or other suitable means.
 - 3. Use tamps and machines of a suitable type which do not crush or otherwise damage the pipe.

3.13 FINAL BACKFILLING

- A. After placement of the granular embedment material has been achieved, perform final backfilling depending upon the location of the work and danger from subsequent settlement.
- B. Backfilling beneath existing or proposed driveways, streets, sidewalks, parking areas or any paved area:
 - 1. Use granular material to backfill trenches.
 - 2. Carefully deposit in uniform layers, not to exceed six (6") inches thick.
 - 3. Compact each layer according to Standard Proctor density of 95 percent by rolling ramming and tamping with tools suitable for that purpose in such a manner so as to not disturb the pipe. Moisture must be at least optimum during compaction.
 - 4. At 200' intervals in the trench, clay check dams shall be installed to inhibit the piping of surface and/or subsurface water. The contractor shall compact full depth two foot (2') clay check dams at each location the trench enters or exits a pavement.
 - 5. Jetting or ponding of native material backfill will not be allowed.

3.14 FIELD QUALITY CONTROL

- A. Compaction Tests: Field density testing of the completed trench backfill shall be performed by an Independent Testing Laboratory.
 - 1. The Laboratory shall make one density test for each 150 linear feet of trench, with a minimum of 1 tests per lift.

END OF SECTION

SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Perform Termite Control work as specified herein.

1.2 QUALITY ASSURANCE

- A. Soil treatment shall be applied by a reliable and established licensed termite control firm thoroughly familiar with local soils and chemicals.

1.3 WARRANTY

- A. Special Warranty: The following warranty shall be submitted to the Owner in addition to the Warranty described in Section 01 7700, Closeout Procedures.
1. Termite treatment shall remain effective for not less than five (5) years from the Date of Substantial Completion. The Contractor shall furnish a written five (5) year warranty stating that if at any time during the five (5) year period subterranean termites occur, treatment will be applied to exterminate infestation without cost to Owner.

1.4 SUBMITTALS

- A. Submittal requirements are specified in Section 01 3300, Submittal Procedures.
- B. Product Data: Submit copies of product information including the specimen label information for the chemical to be used.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Solutions: Aqueous solution of one of the following chemicals:
1. Permethrin (e.g. Dragnet or Permethrin PRO)
 2. Cypermethrin (Demon TC, Probuild TC)
 3. Bifenthrin (Capture, Talstar, Brigade)
 4. Imidacloprid (Premise)
- B. Solutions shall be furnished in the percentages shown on the manufacturer's label. Solutions meeting manufacturers recommendations and FHA and HUD Minimum Property Standards shall be used.
- C. Termite control chemicals shall have EPA establishment and registration numbers.
1. Chemicals that have been banned or are under study by the EPA, though still available to applicators shall not be used on the project.

PART 3 EXECUTION

3.1 APPLICATION

- A. Apply one of the above specified chemicals as follows. Should chemical concentrations recommended by the manufacturer differ from the following, bring these to the attention of the Architect immediately.
 - 1. Under floor slabs within the foundation walls - 1 gallon per 10 square feet.
 - 2. Along inside of foundation walls - 2 gallons per 5 lineal feet.
 - 3. Along outside of foundation walls below finish floor - 2 gallons per 5 lineal feet, per each 1-foot depth. Apply to minimum depth of 5 feet below lowest adjacent grade. Apply as soil is being backfilled at each lift but not more than 2-foot vertical increments. Apply with probe or rod or as recommended by manufacturer for complete coverage.
 - 4. Along expansion or construction joints, 2 gallons per 5 lineal feet.
 - 5. Wherever slab will be penetrated by construction features, 2 gallons per 5 lineal feet.
- B. Chemicals under slabs shall be applied after fill is tamped and rough plumbing is installed. Chemicals shall be applied not more than 24 hours before pouring concrete. Should soil or compacted fill be disturbed after soil poisoning, disturbed areas shall be retreated.

3.2 FIELD QUALITY CONTROL

- A. Equipment shall include a flow meter with a ticketed print-out to assure that the proper quantity of termite treatment chemical is being applied. The print-out shall show the amount of chemical applied, the date and time of application and a standard certification paragraph that the operator signs indicating the printed metered chemical has been applied for the named project. The ticketed print-out shall be retained for submission at project closeout.
- B. The Architect will accept a typed schedule of the chemicals applied, their percent solutions, the amounts and locations, typed on Applicator's letterhead and signed by the Applicator and the General Contractor, in lieu of the ticket printout specified above.

3.3 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition in accordance with Section 01 5000, Temporary Facilities and Controls.

END OF SECTION

SECTION 31 6329

DRILLED CONCRETE PIERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Drilling and cleaning pier holes
 - 2. De-watering of shafts and removal of spoil
 - 3. Casing pier holes
- B. Products Installed, Not Furnished Under This Section
 - 1. Concrete and reinforcing steel
 - 2. Anchor bolts, templates and dowels
- C. Basis for Bids
 - 1. Base Contract Price on number and base depth of piers as shown on Drawings.
 - 2. Do not include temporary casing in Base Contract Sum for drilled piers.
 - 3. Pay depth of straight shaft piers shall be calculated as the sum of the measured depth from ground surface to the top of the bearing stratum, plus the depth that casing is required to extend below the top of the bearing stratum, plus the required penetration into the bearing stratum.
 - 4. No additional depth of drilling will be included in the pay depth unless required in writing by the inspecting agency.
- D. Unit Prices
 - 1. Piers: provide add and deduct unit price per lineal foot shorter or longer than bid depth.
 - a. Above bearing stratum.
 - b. Within bearing stratum.
 - 2. Casings: provide add and deduct unit price per lineal foot for installation and removal of temporary steel casings. Unit price shall be based upon actual length of temporary steel casing as measured from ground elevation to bottom of casing.
 - 3. Unit prices shall be for complete unit of work including labor, materials, overhead, taxes and profit.

1.2 REFERENCES (Latest Edition)

- A. Specifications of the Association of Drilled Shaft Contractors.
- B. American Concrete Institute (ACI)
 - 1. ACI 336.1: "Standard Specification for Construction of End Bearing Drilled Piers"
 - 2. ACI 336.3: "Suggested Design and Construction Procedures for Pier Foundations"

1.3 SUBMITTALS

- A. Pier Log: for each pier record the following:
 - 1. Identification mark
 - 2. Shaft diameter
 - 3. Top of bearing stratum elevation
 - 4. Bottom of pier elevation
 - 5. Penetration of bearing stratum
 - 6. Pier reinforcing (vertical bars and ties)
 - 7. Steel cage length
 - 8. Depth and diameter of casing, where casing required
 - 9. Top of Pier Elevation
 - 10. Concrete quantity
 - 11. Date and time drilling completed
 - 12. Date and time concrete placement begun and completed
 - 13. Plumbness variation

14. Condition of drilled hole before placement of concrete

1.4 QUALITY ASSURANCE

- A. Qualifications
 - 1. Contractor: at least 3 years of experience in similar applications.
 - a. Experience shall be relevant to anticipated subsurface materials, water conditions, shaft sizes and special techniques required.
 - 2. Demonstrate to Architect dependability of equipment and techniques to be used, when requested.
- B. Drilled pier construction shall conform to requirements of ACI 336.1, except as modified by requirements of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store reinforcing cages off of ground and protect from contamination of dirt, grease and corrosion.
- B. Deliver concrete to site in timely manner and in sufficient quantities to allow concreting of each pier as monolithic unit.
- C. Coordinate delivery of concrete to allow placement to begin within 8 hours of completion of drilling.

PART 2 PRODUCTS

2.1 MATERIALS - Refer to related sections for materials installed, not furnished under this section.

2.2 FABRICATION

- A. Prior to drilling pier holes, fabricate reinforcing cages in stock lengths suitable for cutting to required lengths. Bend reinforcing as detailed.
 - 1. Do not splice vertical reinforcing of pier.
 - 2. Do not use cross wire ties that would interfere with tremie pipe or concrete free falling down the center of the cage.
 - 3. Spacers: provide steel band spacers or precast concrete spacers to maintain position of cages within pier holes.
 - 4. End blocks: provide precast concrete end blocks to maintain required clearance at bases of cages.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to beginning installation, review the subsoil investigation report for site provided by Owner; become thoroughly familiar with anticipated subsoil conditions.
- B. Examine site for obstructions to drilling, such as power lines, utilities, material stockpiles, boulders and uneven surfaces. Report anticipated problems to Architect in timely manner so as not to delay schedule of Work.

3.2 PREPARATION

- A. Have ready at site equipment anticipated to be necessary for successful installation of piers, including power augers, core barrels, tremies, hoppers, chutes, and casing, as applicable.
- B. Maintain in ready condition dowels, templates, and anchor bolts required for pier installation.

3.3 INSTALLATION

- A. Drilling Straight Shaft Pier Holes
 - 1. Drill pier holes with power augers or core barrels suitable for subsoil conditions at site.
 - 2. Drill pier holes of required diameters to bearing stratum and penetrate bearing stratum to required depths below top of stratum.

3. Where casing is required, increase pier hole diameter as necessary to accommodate casing having inside diameter not less than required shaft diameter to depth necessary to seal shaft.
 4. Where casing is required, measure required depth of penetration into bearing stratum from top of stratum or from bottom of casing, whichever is deeper from ground surface.
- B. De-watering Pier Holes
1. Remove standing water from pier holes to within 3 inches of base of holes by bailing or pumping.
 2. Where flowing water is encountered, or required water level cannot be maintained, use casing.
- C. Casing Pier Holes
1. Where flowing water or caving soil is encountered use temporary casings to seal sides of shaft.
 2. Casings shall be steel, and of adequate strength to withstand handling stresses and concrete and earth pressures, and shall be watertight.
 3. Extend casings only to depth required to seal off water or caving soil.
 4. Extract casings in vertical lifts, maintaining adequate head of concrete to prevent caving of soils. Do not rotate casing during removal.
- D. Placing Reinforcing Cages, Dowels and Anchor Bolts
1. Place reinforcing steel cages accurately in shafts and hold in position during placement of concrete.
 2. Place dowels and anchor bolts in position, and maintain proper location and elevation with templates.
 3. Use steel bars and bands as required to maintain position of scheduled pier reinforcing within cage.
 4. Use spacers to maintain position of cage within shaft and to maintain minimum 3 inches of concrete cover.
 5. Use end blocks to support cage at required elevation maintaining proper clearance at base of pier.
- E. Placing and Consolidating Concrete
1. Clean pier shafts of accumulated loose material before concreting, and remove water to within 3 inches of base of shaft.
 2. Place concrete within 8 hours of drilling.
 3. Place concrete using a collection hopper with a steel outlet pipe to direct concrete down the center of the shaft. Placing concrete directly into the shaft from concrete truck chute is not allowed.
 4. Extend tremie pipe as required to limit concrete free fall height as follows:
 - a. Shaft diameter 18 inches or less: 10 feet max free fall
 - b. Shaft diameter 20 to 30 inches: 30 feet max free fall
 5. Place concrete in one continuous operation for each pier.
 6. Consolidate top 6 feet of each pier with concrete vibrator.
 7. Where water rises to top of pier during placement, remove over-wetted concrete and replace with sound, dense material.
 8. Remove and replace portions of concrete that become contaminated with mud or spoil material during placement.
 9. Where tops of pier holes become mushroomed during drilling or installation procedures, use round forms to maintain constant diameter.
- F. Tolerances
1. Maximum lateral variation off centerlines: 3 inches
 2. Plumbness of vertical piers within 1 ½ percent of shaft depth to bearing stratum.
 3. Shaft diameter: plus 2 inches, minus 0
 4. Top of pier elevation: plus one inch, minus 3 inches
 5. Penetration of bearing stratum: minus 0, plus 1 foot.
 6. Placement of vertical dowels at tops of piers: plus or minus 1 inch lateral, plus or minus 4 inches vertical.

7. Placement of anchor bolts: plus or minus 1/4 inch lateral, plus or minus 1 inch vertical.

3.4 FIELD QUALITY CONTROL

A. Testing Laboratory and Inspection Services

1. Inspect drilling of each pier hole.
 - a. Determine location of required bearing stratum, measure depth from ground surface.
 - b. Measure overlap of casing into the bearing stratum.
 - c. Measure depth of penetration into stratum.
 - d. Measure shaft diameter. Measure casing diameter where casing required.
 - e. Inspect condition of base prior to concreting.
2. Inspect reinforcing cages
 - a. Check bar sizes and quantity.
 - b. Check tying and splicing of cages.
 - c. Monitor placement and securement techniques.
3. Monitor concrete placement
 - a. Monitor time interval between drilling and placement.
 - b. Inspect placement techniques and conditions.
 - c. Inspect concrete quality at tops of shafts.
4. Material Tests: refer to sections for products installed, not furnished under this section.
5. Field Conditions: where un-anticipated subsurface conditions prevent proper installation of piers, do not proceed with work until directed by Architect.

B. Adjusting

1. Piers for which time lapse between drilling and concreting exceeds maximum shall be reamed, or penetration re-drilled as determined by Architect at no additional cost to the contract.
2. Piers installed without required inspection shall be replaced as directed by Architect at no additional cost to the contract.
3. Pier installations suspect of deficient quality shall be tested and/or corrected as directed by Architect at no additional cost to Owner.
4. Pier shafts drilled deeper than required penetration into bearing stratum shall be filled with unreinforced concrete to the required penetration depth at no additional cost to the contract.
5. If pier shafts are larger than required diameter, except where casing is required, provide additional vertical reinforcing as may be instructed by Architect at no additional cost to the contract.
6. Remove mushrooms - before concrete cures, remove excess concrete from tops of piers so that pier shafts are of constant diameter.

C. Clean-up

1. Remove spoil and debris from the site and legally dispose.

END OF SECTION

SECTION 32 1313

CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Section Includes: New concrete walks, curbs and gutters, paving, approaches, and other concrete flatwork outside the building.
- B. Related Sections:
 - 1. Section 31 00 00 - Earthwork

1.03 REFERENCES

- A. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
- B. ACI 305 - Recommended Practices for Hot Weather Concreting.
- C. ACI 306 Recommended Practices for Cold Weather Concreting.
- D. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- E. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- F. ASTM C309, Type II – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- G. NCTCOG - Standard Specifications for Public Works Construction.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout.
- C. City Standards: Street sidewalks, curbs and gutters, and approaches shall be constructed to meet or exceed the requirements of the City standard specifications (or NCTCOG) where the City standards are applicable.

1.05 SUBMITTALS

- A. Product Data: Submit concrete mix designs in accordance with SECTION 01 3323 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Include data on joint filler, admixtures and curing compounds.
- C. Submit manufacturer's instructions under provisions of SECTION 01 3323 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- D. Confirm proposed joint layout shown on plans; submit revised layout for approval prior to starting work.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not place pavement when base surface or ambient temperature is less than 40 degrees F, or if base surface is wet or frozen.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cements: ASTM C 150, Type I, domestic manufacture.
- B. Fly Ash: ASTM C 618, Class F or C.
- C. Fine Aggregate: ASTM C 33, washed sand with a fineness modulus of between 2.50-3.00.
- D. Coarse Aggregate: ASTM C 33, clean crushed stone or washed gravel. The nominal maximum particle size shall not exceed 1/5 of the narrowest dimension between forms or 3/4 of the minimum clear spacing between reinforcing bars.
- E. Admixture: ASTM C 494, Types "A", "D" and "E", water reducing, chloride-free admixture. Product manufacturer; one of the following:
PSI; Gifford-Hill & Co., Inc.
Pozzolith; Master Builders
Plastocrete; Sika Chemical
- F. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures, equal to Master Builders "Micro Air".
- G. Water: ASTM C 94, Clean and potable.
- H. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- I. Formwork:
 - 1. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 2. Use flexible or curved forms for curves of a radius 100 feet or less.
 - 3. Use forms of size and strength to resist movement during concrete placement.
 - 4. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- J. Reinforcement:
 - 1. Reinforcement Bars: ASTM A 615, Grade 60, deformed.
 - 2. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs. Provide with closed sleeves at one end to allow one inch movement.
 - 3. Tie Bars: ASTM A 615, Grade 60, deformed.
 - 4. Bar Supports: chairs for spacing, supporting, and fastening reinforcement bars, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from plastic to support bars at the proper depth per the details.
- K. Concrete shall meet the requirements specified in plans and specification. Paving and 5" flatwork shall be 6 sack of cement content per cubic yard with a minimum compressive strength of 4000 psi at 28 days and 3000 psi at 28 days for 4" flatwork. (Entrained Air: 3-

- 6%, Slump: 3-5 inches, Fly Ash Replacement – 20% max).
- L. Expansion Joint Filler:
 - 1. ASTM D 1751 preformed strips of asphalt saturated cane fiberboard for joints in standard finished flatwork (walks, curbs and gutters).
 - 2. ASTM D 1752, Type I preformed strips of elastic sponge rubber compound for joints to be caulked with sealant and joints in architectural concrete flatwork.
 - 3. The use of redwood expansion joints is prohibited.
 - M. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL. Product manufacturer; one of the following:
Crafco Inc.; RoadSaver Silicone SL.
Dow Corning Corporation; 890-SL.
 - N. Joint Sealant Backer Rod:
 - 1. Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
 - 2. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.02 MIXING AND DELIVERY

- A. Measurement of concrete materials, mixing, and delivery of fresh concrete to the project shall meet the requirements of ASTM C 94. Transit-mixed concrete supplier shall have a plant with sufficient capacity and transportation facilities to assure continuous delivery at the rate required.
- B. Mix concrete in accordance with ASTM C94, Alternative No. 2, or ACI 304.
- C. Deliver concrete in accordance with ASTM C94.
- D. Select proportions for normal weight concrete in accordance with ACI 301 Method 1. Mix not less than one minute after materials are in mixer.
- E. Do not transport or use concrete after 90 minutes has expired from time of initial mixing.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify compacted subgrade is ready to support paving and imposed loads, free of frost, smooth and properly compacted.
- B. Verify gradients and elevations of base are correct, and proper drainage has been provided so that water does not stand in the area to receive paving.
- C. Beginning of installation means acceptance of existing conditions

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Architect, Owner, and testing laboratory, minimum 24 hours prior to commencement of concreting operations.

- C. Grade Control: Establish and maintain the lines and grades for concrete site work items by means of line and grade stakes. Complete any fine grading required to prepare the subgrade. Maintain the finished subgrade cushions in a satisfactory condition.

3.03 INSERTS AND ACCESSORIES

- A. Make provisions for installation of inserts, accessories, anchors, and sleeves.

3.04 INSTALLATION

- A. Forming: Set forms to lines and grades, and brace and secure to withstand wet concrete without deflection or leakage. Stake forms securely in position with joints keyed to prevent relative displacement. Clean and oil forms each time they are used. Refer to Section 03 11 00 for additional installation requirements.
 - 1. Walks: 4" – 5" thick. Surfaces shall be crowned or sloped to drain.
 - 2. Curbs and Gutters: As detailed.
 - 3. Paving, Drive Approaches: Thicken edges as required.
 - a. 5" thick – Light-Duty Parking Areas Traffic (Parking Areas)
 - b. 6" thick – Medium-Duty Parking Areas (Drives and Fire Lanes)
 - c. 7" thick – Service and Dumpster Areas
- B. Reinforcing: Install reinforcing to meet the requirements of SECTION 03 2000 - CONCRETE REINFORCEMENT. Where reinforcement is not specifically detailed, reinforce pavement and flatwork with #3 rebars at 18" o.c. each way.
- C. Concrete: Place concrete to meet the requirements of SECTION 03 3000 - CAST-IN-PLACE CONCRETE.
 - 1. Place concrete in accordance with ACI 301 and 304. Deposit concrete so that specified slab thickness will be obtained with use of a vibratory screed and finishing operations. Minimize handling to prevent segregation. Consolidate concrete by suitable means to prevent formation of voids or honeycombs. Exercise care to prevent disturbance of forms and reinforcing and damage to vapor retarder. Place concrete to lines and levels shown, properly sloped to drain into adjacent yard areas or drainage structures. **Concrete shall be placed using a walk behind screed machine (Magic Screed). In addition, a backpack vibrator shall be used. A minimum of two (2) screed machines and two (2) backpack vibrators shall be present during all concrete pours.** The surface shall be troweled and edged with a steel trowel and then broomed to obtain a smooth, uniform brush finish.
 - 2. Hot Weather Placement: ACI 305.
 - 3. Cold Weather Placement: ACI 306.
 - 4. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
 - 5. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
 - 6. **The Contractor shall not back over the steel at any time while pouring concrete. Construction sequencing efforts shall be utilized in order to successfully make each concrete pour. If necessary, the Contractor shall utilize concrete pumping to perform the work.**
- D. Expansion Joints: Locate expansion joints around fixed objects within or abutting concrete, and at intervals of not more than 35 ft. o.c. along walks and curbs and 150 ft. o.c. along drive and parking paving unless otherwise shown on the plans.
 - 1. Install preformed filler with the top edge approximately 1/4" below the finished concrete surface to leave a neat, straight joint.
 - 2. Joints shall be 1/2" wide unless specifically dimensioned otherwise on the drawings. Joint edges shall be rounded with an edging tool.
 - 3. There shall be no connection by reinforcement or keyway across expansion joints. Joints shall be held in alignment with sleeved, smooth dowels where required.

4. The use of redwood expansion joints is prohibited.

E. Scoring:

1. Saw cut walks, approaches, and paving using an abrasive or diamond blade. Cut joint width shall be 1/8" and depth shall be 1/4" deep at walks and 1/3 slab thickness at approaches and paving. Cutting of joints must be done as soon as concrete surface is firm enough not to be torn or damaged by the blade (within 4 to 12 hours), and before random shrinkage cracks can form in the concrete slab.
 - a. Score walks at approximately 5-foot intervals each way. Where walks abut curbs, the scoring of walks and curbs shall align.
 - b. Score curbs and gutters at approximately 5-foot intervals. Score curbs to match paving sawcuts.
 - c. Score approaches and paving at approximately 12-foot intervals each way or as shown.

F. Standard Finishing: Strike slabs off true by double screeding to the required level at or below the elevations and grades shown on the drawings. Set edge forms and screed strips accurately to produce the designated elevations and contours.

1. Walks: Float with wood floats to true planes with no coarse aggregate visible. Hand trowel to produce smooth surfaces. Brush surfaces with a soft fiber brush to produce a uniformly striated finish. Edge concrete surfaces with a rounded edging tool.
2. Curbs and gutters: All curbs shall be formed and finished with a preformed mechanical mule. No hand formed curbs shall be allowed except in those areas that require transitioning to a laydown curb, inlet or radii less than 4 feet. Cross brush surfaces with a soft fiber brush to produce a fine brush finish.
3. Approaches: Screed and float to a monolithic medium float finish and belt with a canvas belt to produce a herringbone texture finish.
 - a. Curb Ramps: Provide tooled grooves with chemical staining of concrete as detailed.

G. Curing:

1. Cure concrete 7 days. Coat exposed surfaces with **white pigmented curing compound** for pavement areas and **clear curing compound** for sidewalk/flatwork areas. Protect surfaces from pedestrian and vehicular traffic during the curing period. Damaged areas shall be re-sprayed. Curing compound shall conform to the specifications of ASTM C309, Type 2.
2. Removing Forms: Forms shall remain in place for at least 12 hours after concrete has been placed and finished. Remove forms without damaging the concrete. Bars and heavy tools shall not be used to pry against the concrete in removing the forms. Backfill all curbs.

3.05 FIELD QUALITY CONTROL

A. Concrete Tests: Testing and acceptance of concrete shall meet the requirements specified in the plans and specifications and by the geotechnical firm.

B. Grade and Smoothness Tests:

1. Plan Grade: Finished surface of the flatwork shall not vary more than 0.04 ft. above or below the plan grade or elevation. Finished surfaces of abutting pavement and walks shall coincide at their juncture. Where a new pavement or walk abuts an existing surface, transition pavement or walk strip shall be installed.
2. Surface Smoothness: Finished surface of the flatwork shall have no abrupt changes of more than 1/8" and shall not deviate from the testing edge of a 12 ft. straight edge

more than 1/4" plus or minus tolerance. Flow line of gutters shall not deviate from the testing edge of a 10 ft. straight edge more than 1/8" plus or minus tolerance.

- C. **Concrete Cracking:**
Contractor is responsible for controlling all concrete cracking. If more than one (1) crack per panel occurs, the Contractor may be required to remove and replace the panel as directed by the Engineer or Owner.

3.06 CLEANING

- A. Remove debris, scraps, surplus materials, tools and equipment from the premises upon completion of the work. Clean concrete droppings from walks and curbs. Leave the graded areas free of debris and rubble.

3.07 PROTECTION

- A. Immediately after placement, protect concrete under provisions of SECTION 01 5000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. The pavement shall be closed to all traffic, including vehicles of the Contractor, until the concrete is at least 7 days old or has attained a minimum average of 3,000 psi compressive strength. Repair any damage to the pavement prior to the acceptance by Owner at no additional cost to the Owner. This does not relieve the Contractor from the normal liabilities, and maintenance responsibilities, implied or otherwise, for the pavement or other items.

END OF SECTION

SECTION 32 1723

PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Section Includes: Pavement marking on Portland Cement Concrete Pavement.
- B. Related Sections:
 - 1. Section 32 13 13 - Concrete Paving

1.03 REFERENCES

- A. Federal Specification (FS):
 - 1. FS - TT-P-115F Paint, Traffic, Highway, White and Yellow.

1.04 PROJECT CONDITIONS

- A. Environmental Requirements Apply paint when ambient temperature is 50°F. or above, and relative humidity is below 85%.

1.05 QUALITY ASSURANCE

- A. Installer: Shall have a minimum of 2 years experience in the layout and striping of parking lots.
- B. Job Conditions: Do not apply marking paint when weather is foggy or rainy, or ambient or pavement temperatures are below 40 degrees F., nor when such conditions are anticipated during eight hours after application.

1.06 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions.
- B. Substitutions: Submit in accordance with SECTION 01 60 00 - PRODUCT REQUIREMENTS.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Traffic Paint: Fed. Spec. TT-P-115F, Type III alkyd-chlorinated rubber-chlorinated paraffin marking paint. Striping colors per plans and city requirements. Provide Premium Chlorinated Rubber Base Paint as manufactured by Sherwin Williams, or approved equivalent.
- B. Cleaning Solvent: VM & P Naphtha.

2.02 EQUIPMENT

- A. Applicators: Hand-operated push type marking machine or conventional airless spray equipment with guide lines and templates.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Conditions: Clean and dry free from dirt, loose paint, oil, grease, wax, and other contaminants.
 - 1. Asphalt Surfaces: Allow asphaltic concrete to cure a minimum of 48 hours prior to application of marking paint.
- B. Equipment Condition: Clean previously used paint and solvent from application equipment, using VM & P Naphtha.
- C. Paint: Stir contents thoroughly from bottom of container. Do not thin paint.
- D. Locate markings as indicated on Drawings. Provide qualified technician to supervise equipment and application of markings. Lay out markings using guide lines, templates and forms.
- E. Allow paving to cure before painting as required by manufacturer of traffic paint.
- F. Allow protective coating to cure a minimum of 48 hours prior to application of traffic paint.

3.02 APPLICATION

- A. Using approved equipment, apply paint to a minimum thickness of 15 mils. Stripes shall be 4" wide. Marking edges of stripes and symbols shall be sharply outlined.

END OF SECTION

SECTION 32 1900

WALK, ROAD, AND PARKING APPURTENANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 WORK INCLUDED

- B. Provide and install handicapped parking signs and traffic directional signs.

1.03 REFERENCES

- A.. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 591 Steel Sheet, Cold-Rolled, Electrolytic Zinc- Coated.
 - 2. ASTM B 209 Aluminum and Aluminum-Alloy Sheet and Plate.
 - 3. ASTM C 33 Concrete Aggregates
 - 4. ASTM C 150 Portland Cement
- B. Military Specifications (Mil. Spec.):
 - 1. Mil. Spec. MIL-R-13689A

1.04 SUBMITTALS

- A. Product Data: Submit in accordance with SECTION 01 33 23 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Include catalog, cuts of each type of sign and manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle signs in accordance with SECTION 01 60 00 – PRODUCT REQUIREMENTS and in manufacturer's cartons. Store off ground on planking. Cover with non-staining plastic.

1.06 PROJECT CONDITIONS

- A. Coordinate installation of signs with work of other trades.
- B. Location of signs shall be in accordance with City and State requirements. Signs shall be positioned not to conflict with automobile or pedestrian traffic.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. Site signs: As manufactured by Sa-So (Sargent-Sowell, Inc.) 525 N. Great Southwest Parkway, Grand Prairie, Texas 76011 (phone 972-641-4911), or approved equivalent.

2.02 MATERIALS

- A. Sign Materials: Aluminum Sheets: ASTM B 209, alloy 6061 T6, degreased and etched, 0.080" thickness. Sign faces shall be fully reflectorized with material conforming to Mil. Spec. MIL-R-13689A.
- B. Bolts, Nuts, Washers, and Clamps: Cadmium or galvanized steel. Bolts shall be a minimum of 5/16" in diameter. Clamps shall be two-piece assemblies of at least 14-gage steel or shall be an adjustable steel strap bracket.
- C. Posts: Standard galvanized steel pipe 2-3/8" in diameter and weighing not less than 2 lbs. per linear foot.
- D. Concrete: Provide concrete consisting of Portland cement (ASTM C 150), aggregates (ASTM C 33), and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi, using at least 4 sacks of cement per cubic yard, 1 inch maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

2.03 SITE SIGNS

- A. General: Site signs shall be of the quality manufactured by Sa-So and are listed by Sa-So catalog numbers for convenience in identification.
- B. Accessible Parking Signs: Reflective .080 Aluminum.
- C. Accessible Loading Zone Sign: Reflective .080 Aluminum.
- D. Traffic Signs: Reflective sheeting on 0.080" aluminum.

2.04 WHEEL STOPS

- A. Anchor each unit with minimum of two 12" long x 1/2" diameter steel rods, through unit into pavement.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Excavation: Drill holes of the size indicated for posts. Excavate holes to the depths indicated. Remove excess concrete and excavated soil from the site.
- B. Setting Posts:
 - 1. Remove all loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete. Center and align posts in holes.
 - 2. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Trowel finish tops of footings, and slope or dome to direct water away from posts.
- C. Attach signs to posts with bolts, washers, nuts and clamps.
- D. Clean exposed sign faces and galvanized surfaces, and leave free of defects. Use no abrasives. Leave pavement and graded area clean and free of debris.

END OF SECTION

SECTION 32 3115

VINYL-CLAD CHAIN LINK FENCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary Conditions of the Contract, Division 1 – General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SCOPE

- A. Provide materials, equipment and labor to install vinyl clad chain link fencing and gates. Contractor shall obtain chain link fences as complete units, including necessary erection accessories, fittings and fastenings from a single source or manufacturer.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 1. ASTM A 153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 2. ASTM A 392 – Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 3. ASTM A 446 – Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
 4. ASTM A 569 – Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality.
 5. ASTM A 641 – Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 6. ASTM A 824 – Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain Link Fence.
 7. ASTM C 33 – Specification for Concrete Aggregates.
 8. ASTM C 150 – Specification for Portland Cement.
 9. ASTM F 567 – Practice for Installation of Chain-Link Fence.
 10. ASTM F 669 – Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence.
 11. ASTM F 900 – Specification for Industrial and Commercial Swing Gates.
 12. ASTM F 1083 – Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
 13. ASTM F 1664-08 – Specification for Poly (Vinyl Chloride) (PVC) wand other conforming Organic Polymer-Coated Steel Tension Wire used with Chain-Link Fence
 14. ASTM F 2631-07 – Specification for Standard Practice for Installation of Chain- Link Fences for Outdoor Sports Fields, Sports Courts and Other Recreation Facilities
- B. Chain Link Fence Manufacturer's Institute (CLFMI) Publications:
 1. Product Manual

1.04 SUBMITTALS

- A. Product Data: Submit all shop drawings to Engineer for review.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Provide chain link fences and gates as manufactured by one of the following:

Allied Tube and Conduit Corp.	Capitol Wire and Fence Co., Inc.
American Chain Link Fence Company	Century Tube Corp.

2.02 MATERIALS

- A. Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 12' high. All fencing shall have a knuckled selvage top and twisted/barbed salvage along bottom. Wire size includes zinc coating. The chain link fabric shall be 9 gauge outside finish with 11 gauge galvanized steel core, vinyl clad both selvages knuckled. Color as selected by Engineer.
- B. Framing: Strength requirements for posts and rails shall comply with ASTM F 669.
- C. Pipe shall be straight, true to section, material and sizes specified on plans:

NPS in Inches	Outside Diameter (OD) in inches	Type I Steel (lbs./ft.)
1 ¼	1.660	2.27
1 ½	1.900	2.72
2	2.375	3.65
2 ½	2.875	5.79
3 ½	4.000	9.11
6 ⅝	6.625	18.97

- D. Steel Framework, General: Posts, rails, braces and gate frames.
1. Type I Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated and vinyl covered. Color as selected by Engineer.
- E. End, corner and pull posts: Size as indicated on the plans.
- F. Line or intermediate posts: Size as indicated on the plans.
- G. Top Rail: Manufacturer's longest lengths, with expansion-type couplings, approximately 6" long, for each joint. Provide means for attaching top rail securely to each gate corner, pull and end post.
1. Size as indicated on the plans. Color as selected by Engineer.
- H. Tension Wire: ASTM A 824, 0.177" diameter metallic-coated steel marcelled tension wire, vinyl clad. Color as selected by Engineer.
- I. Tie Wires: 0.148-inch diameter (11 gauge - minimum) galvanized steel or equal, vinyl-clad. Color as selected by Engineer.
- J. Post and Line Caps: Provide weathertight closure cap for each post. Provide line post caps with loop to receive tension wire or top rail. Vinyl-clad and color to be selected by Engineer.
- K. Tension or Stretcher Bars: Hot-dip galvanized steel vinyl clad with minimum length 2" less than full height of fabric, minimum cross-section of 3/16" by 3/4" and minimum 1.2 oz. zinc coating per sq. ft. of surface area. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into post. Color to be selected by Engineer.
- L. Tension and Brace Bands: Minimum ¾" wide hot-dip galvanized steel vinyl clad with minimum 1.2 oz. zinc coating per sq. ft. of surface area. Color to be selected by Engineer.
1. Tension and Brace Bands: Minimum 12 gauge (0.105") thick.
- M. Gates:

1. Gate frames shall be constructed of 2" o.d., Schedule 40 steel pipe secured at corners with malleable iron or pressed steel ells, riveted with four rivets per ell. Frame shall be hot-dip zinc coated after fabrication and vinyl-clad. Color to be selected by Engineer.
 2. Welded gate frames are unacceptable.
 3. Internal bracing shall be 3/8" diameter galvanized truss rods with tighteners.
 4. Hinges shall be pressed steel or malleable iron. Bottom hinge shall be a ball and socket type. All gates shall allow for a one hundred eight (180°) degree swing.
 5. Gates shall be equipped with a heavy duty fork-type latch with lock keeper and lock keeper guide and as indicated on the plans.
- N. Fittings: All fittings to be hot-dip zinc coated vinyl covered shall be 1.2 ounces of zinc per square foot of coated area. Color to be selected by Engineer.
- O. Concrete Post Footings shall be as specified per plans and per manufacturer's recommendations.

PART 3 - EXECUTION

3.03 INSTALLATION

- A. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final grading is completed.
- B. Setting Posts: Center and align posts in holes 6" above bottom of excavation. Space maximum 8' o.c. unless otherwise noted on the plans. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations. Extend concrete footings 2" above grade and trowel to a crown to shed water.
- C. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
- D. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.
- E. Bottom Tension Wire: Install tension wire within 6" of bottom of fabric before stretching fabric and tie to each post with not less than same gage and type of wire. Pull wire taut, without sags. Fasten fabric to tension wire with 11-gauge hog rings of same material and finish as fabric wire, spaced maximum 24" o.c.
- F. Tension or Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to end, corner, pull and gate posts with tension bands spaced not over 15" o.c.
- G. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
1. Maximum Spacing: Tie fabric to line posts 12" o.c. and to rails and braces 24" o.c.
- H. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- I. Fabric: All fabric shall be placed on the inside of school facility.

END OF SECTION

**SECTION 32 8400
PLANTING IRRIGATION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope - Furnish and install an operating irrigation system complete and in place to include pipe, fittings, heads, valves, controller/junction box, pump system, wire and related accessories. The word "Contractor" when used alone shall refer to the irrigation contractor.
- B. Contractor is hereby advised that a PERFORMANCE SPECIFICATION will be in place and that additional equipment, parts and labor shall be furnished as required to provide a proper and satisfactory irrigation system at no additional cost to the Owner.
- C. Adhere to local permit and other requirements. All permits and fees shall be paid by Contractor.
- D. Coordinate installation with other trades as necessary to prevent cutting, patching or re-routing.

1.02 RELATED WORK:

- A. Section 32 9223 – Sodding

1.03 QUALITY ASSURANCE

- A. Materials, Equipment, Installation
Materials, equipment, and installation shall comply with National Fire Protection Association (National Electrical Code), American Society for Testing and Materials, National Sanitation Foundation, Irrigation Association, and all applicable local codes and ordinances. Contractor shall have successfully completed and provide references of a minimum five projects of similar size and scope within the last five years under the same company name.
- B. Licensing
Installation design, pricing and installation shall be made by a contractor licensed as an irrigator by the State of Texas. Skilled workmen shall be used who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this section.
- C. Existing Features
Prior to beginning construction the contractor shall field locate all utilities and maintain their locations. Existing features designated to remain as part of landscape shall be protected. If the contractor causes any damage to existing conditions to remain, then the contractor shall bear the expense of repair.
- D. Damage to Adjacent Facilities
Damage to adjacent facilities caused by irrigation system work shall be repaired promptly at contractor's expense.
- E. Safety
Contractor shall maintain a safe working environment at all times.
- F. The owner or Architect reserves the right to reject any or all work which does not comply with the plans and specifications. Rejected work shall be brought into compliance by the contractor at no additional cost to the owner.
- G. Applicable Standards
ASTM-D2241-Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR)
ASTM-D2464-Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Threaded, Schedule 40
ASTM-D2466-Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40
ASTM-D2564-Solvent Cements for Poly Vinyl Chloride (PVC) pipe and fittings
ASTM-D2855-Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
- H. Contractor Responsibilities
The contractor shall give all necessary notices, file with all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver to the Architect before request of acceptance and final payment for work. Permit fees paid

by owner, Permits obtained by Contractor.

- I. The contractor shall at all times protect his work from damage and theft and replace all damaged or stolen parts at his expense until the work is accepted in writing by the Owner.

1.04 UNIT PRICES:

Provide unit prices for work and materials. Unit prices will be applied when greater or lesser amount of work is required. Unit prices are to be the cost of work and materials in place including materials, equipment, labor, taxes, overhead, guarantee, maintenance and profit.

1.05 REFERENCES:

ASTM - American Society for Testing Materials
D2241: Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
D2287: Flexible Polyvinyl Chloride (PVC) Plastic Pipe.
D2464: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Threaded, Schedule 80.
D2466: Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Socket Type, Schedule 40.
D2564: Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings.
D2855: Making Solvent - Cemented Joints for Polyvinyl Chloride (PVC) Plastic Pipe Fittings.

1.06 DEFINITIONS:

- A. Irrigation Main: That portion of piping from water source to remote control valves. This portion of piping is subject to surges, being a closed portion of the irrigation system. Hydrant lines (QCV) are considered a part of the main line piping system.
- B. Lateral Piping: That portion of piping from remote control valve to sprinkler heads and tubing.

1.07 SYSTEM DESCRIPTION:

Install to provide a complete coverage for lawn and planting areas within limits shown on Drawings. Furnish and install an operating system complete with electrical connection, main and lateral line piping, sprinkler heads, remote control valves, quick coupler valves, wire and any other items required for a complete and operating system.

1.08 SUBMITTALS:

- A. Product Data: Manufacturer's literature in triplicate, neatly bound with cover titled with name and address of project, date of submission, and name and address of Owner, Landscape Architect and Contractor.
- B. Irrigation Plan: Complete plan showing design water pressure, routing and sizing of piping, head placement, type and nozzle size, valve location and size, zone GPM, controller location and size, backflow preventer location and size, and material list indicating manufacturer and model number for each item. Design of system not to exceed manufacturer's requirements for spacing and GPM. Size piping not to exceed 5 F.P.S.
- C. Project Record Documents:
 1. Maintain at site one copy of Drawings, Specifications, Addenda, approved Change Orders and other modifications in good order and marked to record changes made during construction.
 2. Upon completion of work, transpose changes to mylar sepia.
 3. Return sepia to Owner and Landscape Architect prior to issuance of final acceptance. Sepia to include location, by written dimension, of mainline piping, remote control valves and quick coupler valves. Title sepia "Record Drawing" and include date and signature and license of installer.
- D. Provide three complete operation manuals and equipment brochures neatly bound in a hard back three-ring binder. Include any warranties and guarantees extended to the Contractor by the manufacturer of all equipment. Include three (3) executed copies of "Guarantee for Landscape Irrigation System".

1.09 GUARANTEE

- A. The guarantee for the sprinkler irrigation system shall be made in accordance with the attached form. The general conditions and supplementary conditions of these specifications shall be filed with the Owner and the Landscape Architect prior to acceptance of the irrigation system.

- B. A copy of the guarantee form shall be included in the operations and maintenance manual.
- C. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR LANDSCAPE IRRIGATION SYSTEM

We hereby guarantee that the landscape irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship, which may develop, and to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense. We will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____

COMPANY: _____

ADDRESS: _____

PHONE: (____) _____ - _____

DATE OF ACCEPTANCE: _____ / _____ / _____

1.10 PROJECT/SITE CONDITIONS:

- A. Water Supply: Provide as indicated on Drawings. Owner will provide water for required testing, flushing and nozzling.
- B. Sleeves and Ducts: Install as indicated on Drawings. Do not use as main nor lateral piping.
- C. Existing Utilities and Structures: Consult with Owner and appropriate utility companies for location prior to commencing installation. Repair damage due to installation immediately.

Make necessary adjustments in the layout as may be required to connect to existing stub outs, should such stub outs not be located or describes exactly as shown, and as may be required to work around existing conditions.

- D. Storage: Space will be designated at the site.
- E. Barricades: Barricade streets per local codes and regulations during installation.
- F. Deliver materials in original package, cartons, and containers bearing the name of manufacturer, brand and model number.
- G. Protect irrigation system materials before, during and after installation. Exercise care in handling, loading, unloading, coverings and storing plastic pipe and fittings until ready to install. Handle all material in an approved manner. No damage materials shall be used.
- H. In the event of damage, immediately make repairs and replacements necessary at no additional cost to Owner.

1.11 SCHEDULING:

- A. Coordinate with Landscape Contractor and other work.
- B. Prepare a detailed schedule coordinated with the work of other contractors doing work at the site.
- C. Monitor schedules on a regular basis so potential variances can be determined and resolved.
- D. Verify all product orders so delivers are timed to maintain construction schedules.

1.12 MAINTENANCE:

- A. Provide maintenance of system including cleaning and adjustment of heads, raising and lowering of heads, cleaning filters, flushing lateral lines and tubing for 60 days after final acceptance.
- B. Repair backfill settlement of trenches and re-sod during 60 day period.
- C. Drain and flush system within 60 day guarantee period.
- D. Instruct Owner and Owner's personnel in operation and general maintenance of system. Provide Owner with a maintenance manual of materials installed bound in a three ring black vinyl binder.
- E. Repair of damage caused by vandals, other contractors or weather conditions shall be considered extra to the work.
- F. Maintain the entire irrigation system in proper workings order and program the controllers in consultation with Landscape Contractor during the installation and maintenance phase of the work prior to final acceptance.
- G. Provide the Owner with a letter summarizing the warranty stated in this specification and date of final acceptance. This letter shall serve as the Contractor's written guarantee.

PART 2 - PRODUCTS

2.01 BACKFLOW PREVENTION UNITS:

- A. Backflow prevention units shall be:
 - 1. If new, of size and type indicated on the drawings. Install backflow prevention units in accordance with irrigation construction code requirements.
 - 2. If existing, recertified as required by State law and municipal code if more than one (1) year in place
- B. Wye strainers at backflow prevention units shall have a bronzed, screwed body with 60 mesh monel screen and shall be similar to Bailey #100B, or approved equal.

2.02 POLY VINYL CHLORIDE PIPE:

- A. As manufactured in accordance with standards noted herein:
 - 1. Marking and Identification: Continuously and permanently marked with manufacturer's name, pipe size, pipe type and material, SDR number, ASTM standard number and NSF (National Sanitation Foundation) Seal.
 - 2. Pipe Fittings: Of same material as PVC pipe specified and compatible with PVC pipe furnished.
 - 3. PVC Pipe: Class 200, SDR 21, except one-half inch to be Class 315, SDR 13.5. Under paved surfaces and in sleeves to be Schedule 40.
 - 4. Flexible PVC Pipe: Heavy duty flexible vinyl pipe as manufactured by Agricultural Products, Inc.
 - 5. Sleeves: Class 200, SDR 21.

- 2.03 VALVE WIRING:
- A. All wire shall be a minimum of Type UF, No. 14 gauge with 4/64 inch insulation, Underwriters Laboratory approved for direct underground burial when used in National Electrical Code, Class II circuit (30 volts AC or less) and sized not less than specified by manufacturer. Adjust for larger wire size according to field conditions and length of wire run to controller. Color code wire red for lead wire and white for common wire.
- 2.04 WIRE SPLICES:
- A. "Dri-Splice" as manufactured by Spears Manufacturing Company or "DBY Connectors" as manufactured by 3-M Company.
- 2.05 SOLVENT, CLEANER AND PRIMER:
- A. Conform to ASTM D2564
 - B. PVC Pipe and Fittings: Weld-On #705 Solvent and #P-70 Primer.
 - C. Flexible PVC Pipe to Schedule 40 Fittings: Weld-On #795 Solvent and #P-70 Primer.
- 2.06 QUICK COUPLER VALVES:
- A. Shall be 1" bronze bodied valves with a purple rubber seat and plated cover. Keys shall be bronze constructed with 1" FIP x 1" MIP threaded.
- 2.07 ISOLATION VALVES:
- A. Shall be 1" bronze bodied valves with a rubber seat and plated cover. Keys shall be bronze constructed with 1" FIP x 1" MIP threaded.
- 2.08 SWING JOINTS:
- A. All rotor heads shall have a one (1") inch unitized "full circle" type, Lasco #G111-212 swing joint. Use teflon tape on all threaded joints and draw joints up snugly, do not over-tighten.
 - B. All spray heads shall installed on flexible pipe.
- 2.09 IRRIGATION HEADS:
- A. Grass Spray Heads: ABS body with a 4" spring loaded pop-up nozzle assembly and 1/2" FIP connection in base; match product of any existing irrigation unless otherwise directed by Owner.
 - B. High-Pop Spray Head: ABS body with a 12" spring loaded pop-up nozzle assembly and 1/2" FIP connection in base; match product of any existing irrigation unless otherwise directed by Owner.
 - C. Nozzles: Matched precipitation rates plastic nozzle.
 - D. Rotary Spray Heads: ABS body with a 4" spring loaded pop-up nozzle assembly, gear driven with 12 interchangeable nozzles and 3/4" FIP connection in base; match product of any existing irrigation unless otherwise directed by Owner.
- 2.10 REMOTE CONTROL VALVES:
- Normally closed, globe-type diaphragm, glass-filled nylon body and cover, and Buna N reinforced diaphragm with 24-volt, 1/4 amp solenoid in a waterproofed housing. Match product of any existing irrigation unless otherwise directed by Owner.
- 2.11 REINFORCEMENT STAKES:
- A. 1" galvanized pipe long enough to penetrate at least 36" into undisturbed soil. Use two stainless steel worm gear clamps with stainless steel screws to fasten the stake to the quick coupler.
- 2.12 VAVLE BOXES:
- A. Use 10" round box for all field splices, Oldcastle Enclosure Solutions Model 910 with green cover, or approved equal. Extension sleeves shall be 6" PVC minimum size.
 - B. Use 14" X 19" standard rectangular box for all gate valves and quick coupler valves, Oldcastle Enclosure Solutions Model 1419 with green, "Drop-N-Lock" lid cover, or approved equal. Extension sleeves shall be 6" PVC minimum size.
 - C. Use 13" X 24" jumbo rectangular box for all electric control valves, Oldcastle Enclosure Solutions Model 1324 with green, "Drop-N-Lock" lid cover, or approved equal. Extension

sleeves shall be 6" PVC minimum size.

2.13 VALVE BOX INSTALLATION AND BACKFILL:

- A. Use manufacturer valve box extensions as necessary to install top of valve box flush with finish grade.
- B. Securely line interior walls and bottom of valve box with filter fabric
- C. Install clean, washed gravel graded from 1/2" to 1" diameter in bottom of valve box. Do not bury control valve or isolation valve.

2.14 AUTOMATIC CONTROLLER:

- A. If an existing controller is available: connect any new irrigation valves to the existing controllers if possible. Contractor to insure adequate stations are available any all new irrigation. Repair all trench damage to established landscape caused by routing control wiring to controller.
- B. If a new controller is required: Match product and mounting detail of any new irrigation controller with any existing controllers, unless otherwise directed by Owner.
- C. Controller shall be equipped with a minimum three (3) independent programs, each with separate day cycles and a minimum of four (4) start times.
- D. Controller shall be equipped with independent day scheduling options, as well as have water conservation options such as odd/even, budget, and day intervals features.
- E. Controller shall be equipped with a non-volatile memory.
- F. Controller shall be sized large enough to provide one station for each valve installed.
- G. Install per manufacturer's specifications. If exterior installation, insure product is rated for outdoor elements. Provide electrical power as needed as part of the work.

PART 3 - EXECUTION

3.01 DESIGN

- A. As required by State and local code, an irrigation design shall be professionally prepared and submitted for approval as a shop drawing prior to commencement of construction. The irrigation system design shall be customized specifically to the proposed planting of the project.
- B. The designer shall be properly licensed, and in good and current standing with the State in order to present the design and sell the construction services. The design shall be officially sealed by a proper professional as allowed by State law.
- C. The designer shall specify on the drawings all irrigation system components necessary to comply with State law and local code.
- D. It is the intent to provide 1.0" of precipitation for the landscape on this project, during a 7 day watering cycle. Individual zone precipitation rates shall be designed accordingly to provide at least the 1.0" of precipitation per 7 day period.
- E. It is the intent to provide zone separation for this project based on athletic field Turf, shrubs, and flowerbeds, trees and non-athletic field turf. Irrigation Industry standards for head spacing will determine the type of head required in smaller turf areas. In addition, all trees shall be equipped with (1) spray head per tree zoned separately from the shrub and flower bed zones.
- F. All Irrigation sleeving shall be base bid. Irrigation system sleeving will be designed based on using two pvc pipe diameters greater than the pipe(s) being sleeved. Two inch (2") diameter pvc pipe will be used as a minimum size for irrigation wire sleeving. It is the responsibility of the contractor to label on the irrigation design all necessary sleeving for this project. The installation of irrigation sleeving will be the responsibility of the irrigation contractor. Sleeve locations shall be permanently marked on all curbs.
- G. Details will be required with irrigation design for all pertinent construction. Activity, such as valves, controllers, and sprinkler heads.

3.02 INSPECTION

Prior to commencing work, inspect site to verify that the system may be installed as required. The location of underground utilities shall be clearly and distinctly marked prior to start of trenching. Verify property measurements, critical dimensions and finish grades.

3.03 POINT OF CONNECTION (WATER SOURCE)

- A. The irrigation system shall be connected to water supply points of connection as indicated on the approved shop drawings.
- B. The point of connection shall be of an adequate size and as shown on the approved shop drawings.
- C. The Contractor shall be responsible and furnish the point of connection, unless otherwise specified.

3.04 BACKFLOW PREVENTION

Install backflow prevention device in boxes, vaults, or enclosures as required by city code. For subsurface backflow prevention device installation, set boxes and vaults level, plumb and flush with finish grade with a minimum of 18" between any other utility or irrigation component. Center the valve or vault box over the backflow prevention device. Install one backflow prevention device per box or vault.

3.05 ELECTRICAL SUPPLY

- A. Electrical connections for the automatic controller shall be made to electrical points of connection as indicated on the approved shop drawings.
- B. Connections shall be made at approximate locations, as shown on the approved shop drawings. The Contractor is responsible for minor changes caused by actual site conditions.
- C. The Contractor shall be responsible and furnish the electrical connection, unless otherwise specified.

3.06 TRENCHING

Coordinate trenching with other contractors on site. Trenches shall be a minimum of 4 inches wide. All pressurized main line piping shall have a minimum cover of 18" and lateral piping shall have a cover of 12". Minimum cover is measured from top of pipe to finish grade. All excavation shall be unclassified and shall include earth, loose rock, rock or any combination thereof, in wet or dry state.

3.07 BACKFILL

After installing pipe, trenches shall be properly backfill. Backfill shall be rock free and care shall be taken that no rocks or other obstructions rest against the pipe. Water settle backfill in lifts and compact to prevent settling. Contractor shall be responsible for placing additional topsoil, seed or sod to correct depressions after job is completed.

3.08 SLEEVING

Place sleeve pipe for irrigation lines and control wire under hardscape in separate PVC sleeves. Minimum sleeve size shall be 2". Sleeving shall have a minimum of 18" of cover from top of sleeve to bottom of slab and extend into the landscape area a minimum of 6" beyond any hardscape edge.

3.09 PIPE SIZING

Pipe shall be sufficiently sized to not exceed manufacturer's recommendations in volume and velocity.

Maximum velocity shall be 5 feet per second (fps).

Maximum volume per pipe size shall be:

Pipe Size	Max. GPM*
1/2"	5
3/4"	11
1"	16
1 1/4"	26
1 1/2"	35
2"	55
2 1/2"	80
3"	120
4"	200

* GPM: Gallons per Minute

3.10 PIPE INSTALLATION

Install PVC pipe per manufacturer's specifications. Clean solvent welded joints with primer prior to using solvent. Remove excess primer from each joint.

3.11 HYDROSTATIC TEST

- A. Pressure Test: After pipe is laid, joints completed and trench partially backfilled leaving joints exposed for inspection, subject the main line piping for two (2) hour hydrostatic pressure test of 100 psi, or normal city pressure if greater. Open and close each valve during the test.
- B. Defective Material: Examine carefully each pipe joint, fittings and valves during the test. Joints showing visible leakage shall be replaced or remade as necessary. Removed cracked or defective pipe, joints, fittings or valves and replace with new material and repeat test until results are satisfactory. Replacement and repair shall be made at no additional expense to Owner.

3.12 REMOTE CONTROL VALVES

Install remote control valves where shown on the approved shop drawings. When valves are grouped together, allow at least twelve (12) inches between valves. Install each remote control valve in a separate valve box. Each valve number (per the drawings) shall be stenciled on the valve box lid with exterior paint. Paint color shall be flat black. Stencil number size shall be 3" in height.

3.13 BALL VALVES, ISOLATION VALVES

Install ball valves where shown on the approved shop drawings. Ball valves, when installed next to another utility or irrigation component, shall have at least twelve (12) inches clearance. Ball valves shall be located and installed at all mainline direction changes (tees and elbows), mainline trunk legs, and on the meter-side of the alignment prior to going under vehicular pavement. For a looped mainline, install at least one (1) ball valve at the mid-point of the mainline. Install each ball valve in a separate valve box. Each ball valve shall have stenciled on the valve box lid, "BV" with exterior paint. Paint color shall be flat black. Stencil letter size shall be 3" in height.

3.14 QUICK COUPLER VALVES

Install where shown on the approved shop drawings. Quick coupler valves shall be installed within 100' of any proposed tree. Install each quick coupler valve in a separate valve box. Each quick coupler valve shall have stenciled on the valve box lid, "QC" with exterior paint. Paint color shall be flat black. Stencil letter size shall be 3" in height.

3.15 WIRE INSTALLATION

Install in taped bundles and place next to piping. Follow main line piping wherever possible. Install an expansion coil, 1" dia. x 6" long at all directional changes, at each valve connection, and every 100 ft. Properly insulate and waterproof all wire splices. Control wire less than 2000 ft. shall be continuous without splices or joints from the controller to the valves. Make wire splices in valve boxes, do not bury directly in soil. Run extra wires from the controller to the farthest valve. The common wire shall be one color (white), the valve wires shall be of another color (red), and the extra wire shall be of another color (blue).

3.16 AUTOMATIC CONTROLLER

Install the automatic controller(s) in accordance with the manufacturer's instructions. Remote control valves shall be connected to the controller in the numerical sequence as shown on the approved shop drawing.

3.17 SPRAY HEAD INSTALLATION

- A. Grass spray heads: In turf areas, install with tops flush with finish grade. Set a minimum of 3" from sidewalks or curbs. Installation shall also be with flexible pipe to the lateral pipe.
- B. High-Pop spray heads: In non-turf areas and adjacent to sidewalks or curbs, install with tops flush with finish grade. Installation shall also be with flexible pipe to the lateral pipe.
- C. Nozzles: Adjust direction of throw at each head or change nozzle as required to ensure 100% coverage and minimize over-spray onto hardscape.
- D. Rotary Spray Head: Install with head flush with finish grade and attach to lateral piping with swing joint assembly as specified. Installation shall also be with flexible pipe or swing

joint connection to the lateral pipe.

3.18 OPERATIONAL TEST

Upon completion of installation, activate system and adjust for proper operation and efficient distribution of water. Instruct the Owner or his designated representative in the operation and maintenance of system.

3.19 RECORD DRAWING

- A. Provide "Record Drawing" on diskette in AutoCad showing triangulated dimensioned locations of valves, main line piping and wire routes with any modifications of original design.
- B. Locate all dimensions from two permanent points (building, monuments, sidewalks, curbs or paving).
- C. Record all changes which were made from the contract drawings including changes in pressure and non-pressure lines.
- D. Record all information on a set of blue-line prints of system. Do not use these prints for any other purposes.
- E. Maintain information daily. Keep drawings at site and available for review by Owner or his representative.
- F. After record drawings have been approved, transfer information to C.D. in AutoCad format. Make dimensions accurately at the same scale used on the drawings.

3.20 CONTROLLER CHARTS

- A. Do not prepare charts until Record Drawings have been approved.
- B. Provide a controller chart. Chart may be a reproduction of Record Drawing. If photo reduction prints are used, keep reduction to maximum size possible to retain legibility. Chart shall show the actual area covered by controller.
- C. Identify the area covered by each valve using a distinctly different pastel color, drawn over the entire area of coverage.
- D. Hermetically seal approved charts between 2 layers of 20 mil thick clear plastic sheeting.

3.21 OPERATION AND MAINTENANCE MANUALS

- A. Provide two individually bound manuals detailing operating and maintenance requirements for the system.
- B. Deliver manuals to Owner no later than 10 days prior to completion of work.
- C. Provide descriptions of installed materials and systems in sufficient details to permit maintenance personnel to understand, operate and maintain the equipment.
- D. Provide the following in each manual:
 - 1. Index sheet, stating Irrigation Contractor's name, address, telephone number and name of person to contact.
 - 2. Duration of warranty period.
 - 3. Equipment list providing manufacturer's name, make and model, name and address of local manufacturer's representative, spare parts list, detailed operating and maintenance instructions of major components.

3.22 CLEANUP

Clean-up shall be made daily as each portion of the work progresses. Refuse and excess dirt shall be removed, all walks and paving shall be broomed or washed down, and any damage sustained on the work of others shall be repaired to the original condition

3.23 TEMPORARY REPAIRS

The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.24 OPERATION

- A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven (7) calendar days prior to any planting.
- B. The Owner reserves the right to waive or shorten the operation period.

3.25 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Owner, at the time of the final observation. Any items deemed not acceptable by the Owner shall be re-worked to the complete satisfaction of the Owner.
- B. The Contractor shall furnish the Owner with all accessories, charts, record drawings, and equipment as required prior to final inspection.

3.26 OBSERVATION SCHEDULE

- A. When observations have been conducted by someone other than the Owner, show evidence, in writing, of when and by whom these observations were made.
- B. NO site observations will commence without as-built drawings. In the event the Contractor calls for a site visit without as-built drawings, without completing previously noted corrections, or without preparing the system for the said visit, he shall be responsible for reimbursing the Owner at his current billing rates per hour, portal to portal (plus transportation costs) for the inconvenience. NO further site visits will be scheduled until this charge has been paid and received.

END OF SECTION

SECTION 32 9223

SOD

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

The requirements of the "General Conditions of the Contract" shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.02 SCOPE OF WORK

- A. Furnish all labor, material, equipment, and services necessary to provide all landscape sodding, and sprigging work, complete in place, as shown on the drawings and as specified.
- B. Work specified in this Section: The work includes, but is not necessarily limited to:
 - 1. Soil preparation
 - 2. Fine grading
 - 3. Sodding (Solid rolled Sod)
 - 4. Clean-up
 - 5. Maintenance
- C. Related work in other Sections:
 - 1. 32 93 00 TREES, SHRUBS, AND GROUNDCOVERS
 - 2. 32 84 00 IRRIGATION
- D. Definition: The term of "Landscape Architect" shall refer to Teague Nall and Perkins, Inc., 5237 N. Riverside Drive, Suite 100, Fort Worth, Texas 76137.
- E. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1. American Society for Testing and Materials (ASTM): D 1557 Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54 kg) Rammer and 18 in. (457mm) Drop.

1.03 SUBMITTALS

- A. Samples and Product Information: Representative samples or product information of the following materials shall be provided to the Landscape Architect from the supply source that is to be used for turf areas:
 - 1. Topsoil
 - 2. Soil Amendments
 - 3. Fertilizer: specifications and guaranteed analysis.
 - 4. Biological Amendments: ingredients, chemical analysis, and manufacturer.
 - 5. Sod certification documentation to include the following:
 - a. Kind – Bermuda 419, Common Bermuda, St. Augustine, etc.
 - b. Variety –Bermuda 419, etc.
 - c. Lot Number – If applicable
 - d. Record of square feet of sod shipped.
 - e. Bill of Lading / Invoice # - This is an invoice number that can be referenced to the purchaser of the shipment.
 - f. Field # - the field number references the harvested grass to the production field. The field number must be the same as on the certification application and field inspection report.
 - g. Harvest Date – Record the date the grass was harvested.

- h. Grower Name and Address- Record the production company name and address. Use of a stamp is acceptable if it shows on all copies.
- B. Construction Schedule: At least two weeks prior to start of work, submit sodding schedule.
- C. Maintenance: Submit three copies of typewritten instructions recommending procedures to be established by the Owner for the maintenance of the lawns for an entire year. Submit prior to Notice of Substantial Completion. See Section 3.10, 90 DAY MAINTENANCE
- D. Chemicals: Submit products, rates of application, and anticipated uses of any pesticides, herbicides, and fumigants.

1.04 QUALITY ASSURANCE

- A. Contractor's Qualifications
 - 1. The work of this section shall be performed by a Contractor specializing in sodding or landscape installations.
 - 2. The Contractor shall have successfully completed at least 5 installations of this type, size, and complexity in the last four years.
- B. Lawn materials shall comply with all government regulations prevailing at the supply source and the job site.
- C. Fertilizers; Mixed Commercial. Federal Specification: 0-F-241D

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Digging Sod
 - 1. Do not dig sod at the nursery or other approved source until ready to transport sod to the project site or approved storage location.
 - 2. Before stripping, sod shall be mowed at a uniform height of 2".
 - 3. Sod to be cut and delivered in rolled widths.
 - 4. Cut sod to specified thickness and to standard width and length desired.
- B. Transporting Sod
 - 1. Sod transported to the Project in open vehicles shall be covered with tarps or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.
 - 2. Sod shall be kept moist, fresh, and always protected. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.
 - 3. Transporting sod in excess of 20 miles from the site shall be done during evening, night, early morning hours during summer months
 - 4. Upon arrival at the temporary storage location or the site of the work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the Landscape Architect will reject the sod. When sod has been rejected, the Contractor shall remove it at once from the area of the work and replace it at no cost to Owner.
 - 5. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of sod. A legible copy of the invoice, showing species and variety of sod included for each shipment shall be submitted to the Landscape Architect.
 - 6. Certificate of Inspection when required must accompany each sod shipment.

- C. Handling and Storage of Sod
 - 1. No sod shall remain in temporary storage over 30 hours, and less time may be required during extremely high temperatures.
 - 2. Sod shall be kept moist and shall be stored in a compact group to prevent drying out or freezing.
 - 3. Contractor shall take extreme care in the handling of sod material to avoid breaking or tearing strips. Sod that has been damaged by poor handling may be rejected by the Landscape Architect.

1.06 JOB CONDITIONS

- A. Do not install sod on saturated, excessively dry, or frozen soil.
- B. Sod installation shall be subject to suitability of the weather and other conditions affecting sod growth.
- C. Planting season may be extended only with the written permission of the Landscape Architect.

1.07 SAMPLES AND TESTS

- A. The Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. The Contractor shall furnish samples upon request by the Landscape Architect. Rejected materials shall be immediately removed from the site at the Contractor's expense. Cost of the testing of materials not meeting specifications shall be paid by the Contractor.
- B. After rough grading is complete, Contractor shall order and pay for a soil test which includes recommendations. Take a minimum of one soil test per 10 acres - or more as site conditions mandate. Take approximately 15 cores from each uniform soil area. Mix them thoroughly in a clean plastic or paper container. Fill the soil sample bag one-third to one-half full from this representative sample. Acceptable labs are:
 - 1. TPS Lab: "SO-05, TPSL® Plant Natural™ Soil Test + LOI Organic Matter + Solvita®"
 - 2. A&L Plains Agricultural Laboratories: "Basic Test S2" and "Basic Test S3" and "Organic Matter – by Combustion" (all three tests are required)
- C. Submit results to Landscape Architect for adjustment to soil amendments and fertilizers.

1.08 MAINTENANCE

- A. All stored plant material shall be maintained in a healthy, vigorous condition by the Contractor. Maintenance includes, but is not necessarily limited to, mowing, weeding, edging, watering, trash removal, street and gutter cleaning, erosion repair, removal of siltation in drainage areas, and insect and disease chemical applications. The storage area shall be mowed, weeded, and trimmed weekly during the course of construction and the life of the storage area.
- B. Within the limits of construction, the site shall be maintained in a neat, well-kept appearance by the Contractor. Maintenance includes, but is not necessarily limited to, mowing, weeding, edging, watering, trash removal, street and gutter cleaning, erosion repair, removal of siltation in drainage areas, and insect and disease chemical applications.
- C. Contractor shall maintain plant material as described in Part 3.6, 90-DAY MAINTENANCE

1.09 GUARANTEE AND REPLACEMENT

- A. Warrant all lawns for a period of one year from date of Notice of Substantial Completion, to be at least the quality and conditions as at Final Acceptance. Promptly re-sod unacceptable areas during the warranty period as directed by the Landscape Architect.
- B. Lawn shall be uniform in color, grass type, leaf texture, leaf and root density, and free from weeds, diseases, and other visible imperfections at acceptance.
- C. Damage to the irrigation system by other trades or persons (such as shutting off of water or power to the irrigation system) shall not affect the warranty. This means that, especially in the warm season, the Contractor shall make daily visits to the site to inspect and repair the irrigation system up until final acceptance.

1.10 FINAL INSPECTION AND ACCEPTANCE

- A. The Landscape Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance will be based on establishment of a uniform stand of turf grass, defined as coverage of specified grass at a density of 95 percent coverage, with no bare spots greater than one square foot, free of weeds, undesirable grass species, disease, and insects. For grass varieties selected, allow a minimum of 90 days for establishment and maintenance of an acceptable stand of grass.
- C. In areas that are grassed and not irrigated. An acceptable stand of grass shall be established and the Landscape Architect will inspect the work for Substantial Completion upon written request of the Contractor.
- D. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will recommend to the Owner that the work of this Section be accepted.

PART 2 - MATERIALS

2.01 SOLID SOD

- A. Sod shall be as specified on plans, nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully and otherwise maintained from planting to harvest. Sod must be mowed two (2) days prior to cutting.
- B. All sod shall be "Certified Sod" from a licensed and certified sod producer. Provide test results from a plant pathology lab to LA for approval before purchase.
- C. For sports fields, or if called out on plans, use only rolled solid sod.
- D. Thickness of Cut: Sod shall be cut to have minimum pad thickness of:
 - 1. Bermuda Grass: 3/4" minimum thickness, with plus/ minus 1/8" tolerance
 - 2. St. Augustine and Zoysia Grass: 1" thick, with plus/ minus 1/8" tolerance
- E. Width and Length of Sod: Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2" on width, and plus or minus 5% on length. Broken strips and torn or uneven ends will be rejected.

- F. Strength of Sod Strips: Sod strips shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.
- G. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively wet or dry) may adversely affect its survival.
- H. Sod shall consist of live growing plants secured from sources which have dense, thickly matted root system throughout the soil of the sod for a minimum of one inch. Sod shall be free of weeds or other varieties of grasses.
- I. Reject any Sod whose roots are dried because of sun or wind. The landscape architect has the right to reject any or all of sod due to lack of care, improper cutting, or other agronomic problems.
- J. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 30-hour period unless a suitable preservation method is approved by the Landscape Architect prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Landscape Architect prior to its installation.
- K. Thatch: Sod shall be relatively free of thatch. A maximum on 1/2" (uncompressed) thatch will be permitted.
- L. Sod shall be free of diseases, harmful insects, nematodes, soil borne diseases, Nutsedge, and all other grassy and broadleaf weeds.
- M. Fertilizer for Sod areas: Italpollina 4-4-4 or approved equal. Product shall be an OMRI registered organic fertilizer of a guaranteed analysis, 4-4-4, containing no less than 41% total organic Carbon, 71% organic matter, and 5% humic acid. Contact: Allen Olson (817) 368-8615, allen@gdrsystems.net

2.02 TOPSOIL

- A. All existing topsoil stripped for this work and suitable for reuse shall be stored on site as directed by the Landscape Architect. Dispose of all excess topsoil on the site as directed by the Landscape Architect.
- B. Utilize on-site and imported topsoil to provide a minimum six-inch (6") layer of approved soil for sod installation as specified and indicated on the Drawings.
- C. If on-site topsoil is not available, imported topsoil shall be used as indicated on the drawings and as follows:
 - 1. Imported Top Soil shall be natural, loose, fertile, friable, screened agricultural soil, having characteristics of representative productive soils in the vicinity, and obtained from naturally well-drained areas. Imported Soil for sod areas to be: "Enriched Top Soil", by Soil Building Systems, (972) 831-8181, or approved equal, submit a 1-quart package with supplier label attached to sample.
 - 2. Silt plus clay content of the import soil shall not exceed 20% by weight with a minimum 95% passing the 2.0-millimeter sieve. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECe) of the saturation extract of this soil shall not exceed 3.0 millimhos per centimeter at 25 degrees centigrade. The boron content shall be no greater than 1 part per million as measured on the saturation extract. In order to ensure conformance, samples of the import soil shall be submitted to the laboratory for analysis prior to, and following, backfilling.
 - 3. Imported Top Soil shall be free of insects, harmful nematodes, soil-borne diseases, toxins, heavy clay, select fill, inorganic subsoils, heavy metals, trash,

petroleum by-products, rocks over 1" diameter, rubble, roots, Nutgrass, or weeds, or weed seeds.

4. Imported Topsoil shall have a pH between 6.5 - 7.3.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Obtain written certification from the General Contractor that final grades to within 0.10' have been established prior to commencing planting operations. Provide for inclusion of all amendments, settling, etc. The Contractor shall be responsible for shaping all planting areas as indicated on the drawings, or as directed by the Landscape Architect.
- B. Inspect site to ensure that it is ready to be sodded and that irrigation system is working for all areas to receive sod.

3.02 EXCAVATION

- A. In all sod areas, the Contractor shall *thoroughly* remove from the construction site all limestone larger than 1/2" in diameter and all heavy clay to a minimum depth of 6". The LA shall verify that this is complete before the Contractor is authorized to proceed with fill of specified topsoil or grading. Scarify subsoil after removal of rock or heavy clay before adding topsoil so as to break up any surface tension.
- B. The Contractor shall thoroughly remove from the construction site all the following particles that are larger than 1/2" in diameter: inorganic select fill, heavy clay, limestone, and construction debris, mortar, concrete, paint, paint thinner, chemicals, weeds, plastic, paper, steel, wire, mortar, masonry, construction debris, and other substances that are harmful to plant growth. Remove the above items to these depths: 6" minimum in turf and seed areas, and 18" minimum in planting beds. The LA shall verify that the above items are removed before the Contractor is authorized to proceed with fill with specified topsoil or grading. **DO NOT PLACE ANY FILL ON CONSTRUCTION DEBRIS.**
- C. After clean-up described above and establishment of subgrade, drag entire planting area with teeth of bucket to scarify subsoil to a depth of 4" to break up surface tension and allow water to pass downwards through the soil.
- D. If soils are rocky or full of limestone or heavy clay, install irrigation system before adding topsoil so as to keep limestone or clay below imported topsoil and the root zone of plants.
- E. Excavation for planting shall include the stripping and stockpiling of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits, and planting beds.
- F. Excess soil generated from the planting holes and not used as backfill or in the establishment of the final grades, shall be removed to an on-site location, as approved by the Owner. Unacceptable excess soil shall be removed to an appropriate off-site location.
- G. Protect all areas from excessive compaction when trucking plants or other material to the planting site. Existing vegetation identified by the Landscape Architect to remain, shall be protected from trucking operations during construction.

3.03 PRE-PLANT WEED CONTROL

- A. After the irrigation system is operational and approved by the Landscape Architect, apply water for seven (7) to ten (10) calendar days, as needed to achieve weed germination.

- B. If live perennial weeds exist on site at the beginning of the work, spray with a non-selective, systemic contact herbicide, as recommended and applied by an approved, licensed landscape pest control applicator. Leave sprayed plants intact for at least fourteen (14) days to allow systemic kill. Reapply at 2-week intervals until a complete kill is achieved.
- C. Clear and remove these existing, dead weeds by mowing or grubbing off all plant parts at least 1" below the surface of the soil over the entire area to be planted.
- D. Maintain the site weed-free until final acceptance by the Landscape Architect, utilizing mechanical and chemical treatment.

3.04 SOIL PREPARATION

- A. Grade Preparation
 - 1. Immediately before sodding, power-rake, scarify, loosen, float and drag the upper 6" of topsoil to bring it to the proper condition. Remove foreign matter larger than 1/2" in diameter. Sod areas shall have topsoil that is smooth and compacted to 85% after preparation.
 - 2. If there is not sufficient existing approved topsoil on site, apply imported topsoil as specified in Section 2.1 G, MATERIALS, to achieve finish grade. If required, import topsoil to achieve depth of (6") of approved topsoil in all turf areas.
 - 3. Fine Grading: After tillage and cleaning, all areas to be planted shall be leveled, fine graded, and drag with a weighted spike harrow or float drag. The required result shall be the elimination of ruts or depressions that would cause water to stand or pond immediately after rainfall or operation of the lawn irrigation system, humps, and objectionable soil clods. This shall be the final soil preparation step to be completed before the commencement of fertilizing and planting.
 - 4. If the prepared grade is eroded or compacted by rainfall prior to fertilizing, rework the surface to specified condition.
 - 5. Sod to be placed after final grade is approved in a timely manner not to exceed a 48-hour period from time of approval to laying of sod.
- B. Spreading of Topsoil:
 - 1. Topsoil and subgrade shall be damp when topsoil is spread. Top of subsoil shall be scarified and loose, not a hardpan before adding topsoil.
 - 2. Areas to be sodded shall be top-soiled to a minimum depth of six in. (6"), compacted measure. Provide additional topsoil depths as required to construct the grades indicated on the Drawings. Topsoil shall be compacted to 85%, determined in accordance with ASTM: D 1557. Onsite topsoil is to be used unless it is not available, or is more than 25% clay, or is more than 10% limestone, or is rocky.
- C. Fertilizing for Sod Areas:
 - 1. Till specified fertilizer (along with any amendment) into the top 1" of area to receive sod. Work fertilizer into the soil to a depth of 1/2"-1" after fine grading & not more than 2 days prior to grass planting. Cultivating equipment shall be set so the fertilizer will not penetrate the soil more than 1 inch. Do not apply fertilizer when there is a possibility of rain before lawn areas can be sodded.
 - 2. Uniformly distribute granular Sod Fertilizer (See Section 2.2 M) by mechanical means at the rate of 1200 lbs. per acre or 28 lbs. per 1000 sq. ft.
 - 3. Irrigate soil after fertilizer application and 1- 4 hours prior to laying sod.

3.05 SODDING

- A. Weather Conditions
 - 1. Schedule work for periods of favorable weather.

2. Do not place Sod on days that, in the judgment of the Landscape Architect, are too hot, sunny, dry, cold, wet, or windy for optimal growth.

B. Placement Pattern

1. The first row shall be laid in a straight line with subsequent rows parallel to the first row and tightly abutting each other.
2. Lateral joints shall be staggered. Care shall be exercised to ensure that the sod is neither stretched nor overlapped. Joints must be butted tightly to prevent voids that could permit air to dry out roots.
3. Immediately after placing, sod shall be pressed firmly into contact with sod bed by tamping or rolling to eliminate air pockets.
4. When on slopes steeper than 4 to 1, sod shall be secured by galvanized pins, wood pegs or other methods approved by the Landscape Architect.
5. Sand joints and top dress turf with topdressing sand as necessary to provide a smooth uniform finished surface.
6. Immediately after sodding operations have been completed, entire surface shall be compacted with a roller or other approved equipment. The completed area after sodding shall be uniformly even, firm, and true to finished grade lines.

C. Rolled Sod

1. For sports fields, or if called out on plans, use rolled solid sod.
2. Runs of rolled sod shall be maximized to minimize small pieces. Lay sod to avoid small or skinny pieces.
3. A bobcat and/or tractor with extra-wide tires and a "big roll" attachment shall be used to lay the rolls of sod.
4. Plastic netting shall be removed as sod is rolled out and properly disposed of upon installation as shown in the following photo:



D. Watering:

1. Provide an adequate supply of water to keep the sod thriving at the site prior to and during transplanting of the sod.

3.06 CLEAN-UP

- A. After all planting operations have been completed, remove all trash, excess soil, empty plant containers, pallets, ties, rubbish, and all debris associated with this contract from the site. All scars, ruts, trench settlement, or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. The Contractor shall pick up all trash resulting from this work no less frequently than each Friday before leaving the site, once a week, or the last working day of each week. All trash shall be removed completely from the site.

- B. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the Contract area, leaving the premises in a clean condition. All walks shall be left in a clean and safe condition.
- C. Excess topsoil not required for lawns or planting shall be stockpiled on site for future use as directed by the Owner's representative.
- D. Repair existing lawns damaged by operations under the contract. Repair shall include finish grading and sodding as required to match existing grade and lawn, and maintenance of repaired areas.

3.07 OBSERVATION SCHEDULE

- A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following site visits, according to the time indicated:
 - 1. Pre-job Conference - 7 days
 - 2. Final grade review - 2 days
 - 3. Sod material review - 2 days
 - 4. Soil Preparation and planting operations - 2 days
 - 5. Pre-maintenance - 7 days
 - 6. Final inspection - 7 days
- B. When observations are conducted by someone other than the Landscape Architect, the Contractor shall show evidence, in writing, of when and by whom these observations were made.
- C. NO site visits shall commence without all items noted in previous Observation Reports either completed or remedied unless such compliance has been waived by the Owner. Failure to accomplish punch list tasks or prepare adequately for desired inspections shall make the Contractor responsible for reimbursing the Landscape Architect at his current billing rates per hour, portal to portal (plus transportation costs) for the inconvenience. NO further inspections shall be scheduled until this charge has been paid and received.

3.08 GUARANTEE

- A. All plant material shall be guaranteed by the contractor for a period of one (1) year from the date of final acceptance.
- B. At the end of the guarantee period the Landscape Architect and Contractor shall inspect plant material. Any plant material under this contract that is dead or of an unsatisfactory growth condition shall be removed and replaced in a timely fashion by the contractor, at no cost to the owner.

3.09 ACCEPTANCE OF WORK

- A. The contractor and Landscape Architect shall conduct an on-site inspection of all work and materials to determine compliance of work with the construction documents.
- B. The contractor shall, within reasonable means, provide the Landscape Architect with sufficient data to demonstrate compliance with the construction documents.
- C. The contractor shall be notified in writing of any non-conforming items, which are to be corrected (punch-list).
- D. The contractor and Landscape Architect shall conduct an on-site inspection to verify completeness of punch list items.

- E. Acceptance of work by the Owner shall begin upon verifying completion of punch list items and receipt of all deliverable items to Owner including letter of guarantee; release of liens waiver, record drawings denoting deviations from contract drawings, product data and maintenance guide.
- F. The contractor shall receive written notification of date of final acceptance and ending date of required guarantee periods from the Landscape Architect.

3.10 90 DAY MAINTENANCE

- A. The maintenance period shall commence when the Notice of Substantial Completion is issued and shall continue as required for a period of 90 days.
- B. Immediately after sodding, the area shall be protected against traffic or other use by erecting barricades as needed, and by placing approved warning signs at appropriate intervals.
- C. Contractor shall touch-up sod areas as required to achieve 100% coverage at no cost to Owner.
- D. Mow turf grasses only (not wildflower or native grass areas) during establishment only for the purpose of weed control and to promote quicker spreading.
 - 1. Mow Bermuda and Zoysia Grass to a 2" height.
 - 2. Mow St Augustine Grass to a 4" height.
 - 3. Mow at least once a week in the growing season once turf is rooted and growing.
- E. Fill any depressions, settlement, or washouts that occurs within 90 days following installation. Re-sod bare spots that occur during the maintenance period as directed by the Landscape Architect at no cost to Owner.
- F. Keep lawns clean and protected from damage during the maintenance period. Debris that accumulates shall be removed from the site. Promptly repair damaged lawns except as provided in Section 1.9, GUARANTEE AND REPLACEMENT.
- G. Irrigate as required to supplement natural rainfall so that all lawn areas receive sufficient water for normal plant growth. Furnish all irrigation equipment needed for watering and be responsible for securing adequate supply of water if an automatic irrigation system does not exist, is not operating or is damaged.
- H. A second fertilizer application shall be made 60 days after installation to turfgrasses. The specified fertilizer (see section 2.1.L) shall be applied at 800 pounds per acre or 18 lbs. per 1,000 SF.

END OF SECTION

SECTION 33 1000

WATER UTILITIES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established in the North Central Texas Council of Government (NCTCOG) Standard Specifications for Public Works Construction, City Specifications, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Work Included:
 - 1. Installation of pipe material, fittings and concrete blocking.
 - 2. Construction of fire hydrants, water meters, service lines, gate valves and detector checks.
 - 3. Construction of improvements to City service stub.
 - 4. Coordination with City work forces for extension of water improvements to serve this site.
- B. Related Work Specified in Other Sections
 - 1. Section 31 23 33 - Trenching and Backfilling
 - 2. Section 31 00 00 - Earthwork

1.03 COORDINATION

- A. Contractor shall coordinate installation of water system with other construction throughout the site.
- B. All construction shall conform to NCTCOG and applicable City Standard Specifications for Construction.
- C. All work of this Section shall be completed within the limits of the site property boundary or public right-of-way.

1.04 REFERENCES

- A. AWWA C900: Requirements for PVC pressure pipe 4" thru 8" pipe
- B. AWWA C110 or C907: Ductile Iron Fittings.
- C. AWWA C502: Fire Hydrant Installation.
- D. AWWA C500: Gate Valves
- E. Texas Commission on Environmental Quality (TCEQ), Title 30 Texas Administrative Code (TAC), Chapter 290, "Public Drinking Water".
 - Rule §290.38 Definitions
 - Rule §290.39 General Provisions
 - Rule §290.44 Water Distribution
 - Rule §317.13 Appendix E – Separation Distances
- F. NSF International NSF/ANSI 61 Drinking Water System Components – Health Effects
- G. National Fire Protection Association (NFPA) NFPA 24 Installation of Private Fire Service Mains and Their Appurtenances

1.05 SUBMITTALS

- A. Submit manufacturer's product data sheets to Engineer for review. All pipe, fittings and appurtenances not covered by this specification shall be approved by the engineer 7 days prior to bid.

- B. Test Reports: Provide two (2) copies of each field quality control tests including, but not limited to hydrostatic tests, bacteriological tests, infiltration/exfiltration tests, mandrel tests, video camera test, flow test, etc.
- C. Contractor is to accurately record installation of piping systems with appurtenances and present the information to Owner at the completion of the project as "Project Record Drawings".

PART 2 - PRODUCTS

2.01 PIPE

- A. Polyvinyl Chloride (PVC) water pipe and fittings with dimension control.
 - 1. PVC Water Pipe, 4" through 12": AWWA C900, Class 150, DR-18.
 - 2. PVC Fireline Pipe, 4" through 12": AWWA C900, Class 200, DR-14.

2.02 FIRE HYDRANTS

- A. Manufacturer and style per City specifications and applicable sections of NCTCOG Item 502.3.

2.03 GATE VALVES

- A. Manufacturer, type per City specifications and applicable sections of NCTCOG Item 502.6.

2.04 WATER METERS, DETECTOR CHECK

- A. Manufacturer, type per City specifications and applicable sections of NCTCOG Item 502.10.

2.05 METER BOXES, VAULTS

- A. Precast/cast-in-place per City specifications, plan details and applicable sections of NCTCOG Item 502.10.

PART 3 - EXECUTION

3.01 GENERAL

- A. The locations of all structures and lines and grades of all pipes shall be staked by a registered surveyor. All facilities shall be located according to the site layout plans.

3.02 PIPES

- A. All pipe shall be inspected prior to installation. Damaged pipes shall not be used. Replacement of damaged pipe shall be made by the Contractor at no expense to the owner.
- B. Pipe installation shall conform to the North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction.

END OF SECTION

SECTION 33 3000

SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established in the North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction, City and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Work Included:
 - 1. Installation of pipe material.
 - 2. Construction of manholes.
 - 3. Connection to existing sewer system.
- B. Related Work Specified on Other Sections
 - 1. Section 31 23 33 - Trenching and Backfilling
 - 2. Section 33 00 00 - Earthwork

1.03 COORDINATION

- A. Verify flowline elevation at connection to existing manhole; notify architect if elevation is more than 0.1' above plan elevation.
- B. Coordinate installation with other construction throughout the site.
- C. All construction shall conform to NCTCOG and applicable City Standard Specifications for Construction.

1.04 REFERENCES

- A. ASTM D3034: Specifications for PVC Sewer Pipe 4" through 15" in diameter.
- B. ASTM D2321: Practice for Installation of Underground Installation

1.05 SUBMITTALS

- A. All pipe and fittings not covered by this specification shall be approved by the engineer seven days prior to bid.

PART 2 - PRODUCTS

2.01 PIPE

- A. Polyvinyl Chloride (PVC) sewer pipe and fittings with dimension control.
 - 1. Pipe shall be SDR-26.
 - 2. Pipe Fittings: Pipe fittings shall conform to ASTM D1784. Fittings approved by the Engineer shall also be acceptable.
 - 3. Balance of specifications shall be covered by Item 501.17 per NCTCOG.

2.02 Structures

- A. Materials for the construction of manholes shall be as specified in Division 7, "Concrete Structures" of the NCTCOG's Standard Specifications for Construction.

PART 3 - EXECUTION

3.01 GENERAL

- A. The locations of all structures and lines and grades of all pipes shall be staked by a registered surveyor. All facilities shall be located according to the site layout plans.
- B. Contractor shall utilize necessary measures including temporary pumping and collection until the public sewer improvements are installed and operational.

3.02 PIPES

- A. All pipe shall be inspected prior to installation. Damaged pipes shall not be used. Replacement of damaged pipe shall be made by the Contractor at no expense to the owner.
- B. Installation shall be in accordance with NCTCOG and City specifications and as recommended by the pipe manufacturer. Backfill shall be per plans.

3.03 STRUCTURES

- A. Construction of manholes shall be as specified in Division 7, "Concrete Structures" of NCTCOG and the City Standard Specifications for Construction.
- B. Connections of pipe to structures shall be completely mortared around the perimeter of the pipe to ensure connection to the structure prior to backfilling. Pipe shall have a rubber boat placed over the end prior to pouring concrete structure or grouting.
- C. All manholes in pavement areas shall be held below pavement and the frame/lid shall be adjusted to final grade with grade rings. There should be no abrupt grade changes at manholes rims. **If abrupt grade changes are present, grade adjustments will be required.**

END OF SECTION

SECTION 33 4000

STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.02 SUMMARY

- A. Work Included:
 - 1. Installation of pipe material.
 - 2. Construction of drainage system structures including curb inlets, junction boxes and catch basins.
 - 3. Ditch-out for storm drainage system discharge.
- B. Related Work Specified in Other Sections
 - 1. Section 31 23 33 - Trenching and Backfilling
 - 2. Section 31 00 00 - Earthwork

1.03 COORDINATION

- A. Contractor shall coordinate installation of drainage system with other construction throughout the site.
- B. All construction shall conform to applicable City Specifications for Construction.
- C. All work of this Section shall be completed within the limits of the site property boundary or designated offsite easements.

1.04 REFERENCES

- A. ASTM C76: Specification for Reinforced Concrete Pipe.
- B. AASHTO M294 HDPE Pipe
- C. ASTM F477 HDPE Fittings

1.05 SUBMITTALS

- A. All pipe and fittings not covered by this specification shall be approved by the engineer seven days prior to bid.

PART 2 - PRODUCTS

2.01 PIPE

- A. Reinforced concrete pipe shall be Class III.
- B. Plastic pipe shall be PVC SDR35 or Schedule 40 or HDPE heavy wall meeting the requirements of AASHTO M294 and ASTM F477 with corrugated exterior with smooth lined interior. All pipe joints and fittings shall be watertight
- C. ADS HP Storm polypropylene pipe (dual wall) meeting the requirements of AASHTO M330, ASTM F2736 and ASTM F2881 with smooth inner wall and annular exterior corrugations.

2.02 DRAINAGE STRUCTURES

- A. Materials for the construction of inlets and junction boxes shall be as specified in Division 700, "Structures" of the NCTCOG's Standard Specifications for Construction.

PART 3 - EXECUTION

3.01 GENERAL

- A. The locations of all structures and lines and grades of all pipes shall be staked by a registered surveyor. All facilities shall be located according to the site layout plans.
- B. Contractor shall utilize necessary measures, including temporary pumping in order to drain storm water offsite until the public drainage improvements are installed and operational.

3.02 PIPES

- A. All pipes shall be inspected prior to installation. Damaged pipes shall not be used. Replacement of damaged pipe shall be made by the Contractor at no expense to the owner.
- B. Installation shall be in accordance with ASTM D2321 and as recommended by the pipe manufacturer. Backfill shall be ASTM D2321 Class I, II or III soils.
- C. Pipe installation shall conform to the North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction & City specifications.
- D. Concrete collars shall be constructed where there is a change in pipe material

3.03 DRAINAGE STRUCTURES

- A. Construction of curb inlets tops and catch basins in pavement areas shall be **cast-in-place only** with **no precast structures allowed**. All manholes in pavement areas shall be held below pavement and the frame/lid shall be adjusted to final grade with grade rings. There should be no abrupt grade changes at manholes rims. **If abrupt grade changes are present, grade adjustments will be required.** Catch basins and headwalls outside of pavement areas shall be either cast-in-place or precast.
- B. Connections of pipe to structures shall be completely mortared around the perimeter of the pipe to ensure watertight connection to the structure prior to backfilling. All bends and tees shall be precast/preformed.
- C. Inlet top and throat shall be poured once pavement improvements are in place.

END OF SECTION